ANNUAL METEOROLOGICAL REVIEW

OF THE

STATE OF CALIFORNIA,

FOR THE YEAR 1888,

BY THE

Meteorological Department of the State Agricultural Society.

COMPILED BY

SERGEANT JAMES A. BARWICK,
Observer Signal Corps, U. S. Army, and Meteorologist to the
State Board of Agriculture.

SACRAMENTO:
STATE OFFICE : : : J. D. YOUNG, SUPT. STATE PRINTING.
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And Headquarters of the Meteorological Department of the State Agricultural Society, Sacramento, California.

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Accept compliments of the Compiler, and please promptly acknowledge receipt of this Review.

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Collated and compiled by Sergeant James A. Barwick, Observer Signal Corps, U. S. A., and Meteorologist to the State Board of Agriculture.

Sacramento, California, May 1, 1889.

Edwin F. Smith, *Secretary State Agricultural Society:*

Sir: I have the honor to transmit herewith my fifth annual weather review for the year 1888, of the State of California, as meteorologist to your Society. The greater portion of the State is herein represented, some portions better than others—the cause of which is due to the impossibility of getting those who ought to be interested in such matters to forward any data whatever; this is especially so in regard to San Diego City and County. I wrote to three different parties, including the Signal Service Observer at San Diego, who is the only one of the three that responded, and his report is very meager of meteorological data to what it could be made. If data asked for is not forthcoming, then certainly I am not to blame, nor should I be held responsible for the small space that portion of this State may occupy in this review. I must confess that I myself am greatly disgusted and discouraged at the small amount of interest taken by its people in the climatic conditions of this State, which stands preëminently as the central and best portion of the Pacific Slope, as well as the great and glorious Golden West. Even our snowy neighbor, silvery Nevada, has had established a "State Weather Service," by its intelligent and far-seeing legislators. Certainly, if that State deems a systemized and accurate record of its climate should be blazoned and advertised to the world, what ought Californians to think, whose glittering golden star of destiny stands out in magnificent brilliancy, amidst the grand galaxy of twinkling emblems that deck the blue field of our great American banner, the stars and stripes, whose colors may never grow dim, nor its folds be trailed in the dust by an enemy. Why, our Oregonian neighbors of the north elected members to their Legislature, who, during their session of 1888–89, covered themselves, not with ingratitude, but with everlasting honor and glory by passing a bill that gives to the people of that community a "State Weather Service," whose climate is never so good, healthful, or healing as our own. How long? O Lord! how long will our scions of civilization, monopolization, and culture travel

in the ruts of our grandfathers, and instead of being at the head of advancing science of climate, health, and beauty, are satisfied to bring up the rear and come in last in the race for advancement in all the details of encouragement to immigration, that they may assist in the fructification and increased fruitfulness of our land? Let it come quickly will ever be the desire and wish of yours, very truly, etc.,

JAMES A. BARWICK,
Meteorologist of the State Agricultural Society.

GENERAL WEATHER REVIEW OF SACRAMENTO CITY AND COUNTY.

This city is geographically situated in latitude north 38° 35′; longitude west from Greenwich, 121° 30′; elevation above sea level, 35 feet; elevation of the zero point of the barometer cistern above sea level, 64 feet.

The following tabulated data show the general meteorological features of the weather of this city for the months of January, February, March, and April, from 1878 to 1889, inclusive. For May, and June, from 1878 to 1888, inclusive, and for July, August, September, October, November, and December, from 1877 to 1888, inclusive. A review by seasons, winter, spring, summer, and autumn. Also, an annual review of the weather from 1878 to 1888.

January Weather in Sacramento, from 1878 to 1889.—This table shows the mean average barometer, the highest, lowest, and range of barometer; the average temperature, highest, lowest, and monthly range of temperature; the greatest and least daily range of temperature; the average maximum, minimum, and range of temperature; average relative humidity and dew point; prevailing direction of wind, total rainfall, monthly velocity of wind, maximum velocity of wind, and prevailing direction at time of maximum velocity; clear, fair, cloudy, and foggy days; number of days rain fell; thunder and lightning storms; solar and lunar halos; light and killing frosts; days snow fell; number of days the temperature was below 32°.

JANUARY:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Average barometer	30.05	30.15	30.16	30.15	30.14	30.27	30.16	30.18	30.09	30.16	30.13	30.09
Highest barometer	30.33	30.58	30.44	30.46	30.42	30.61	30.58	30.43	30.40	30.51	30.63	30.37
Lowest barometer	29.46	29.85	29.74	29.80	29.75	29.88	29.60	29.87	29.32	29.69	29.51	29.51
Range of barometer	0.87	0.73	0.70	0.66	0.67	0.73	0.98	0.56	1.08	0.82	1.12	0.86
Average temperature	49.7	45.5	43.5	49.2	45.2	42.0	46.6	47.2	45.7	48.5	42.8	44.6
Highest temperature	62.0	63.0	61.0	64.0	62.0	62.0	61.0	62.0	62.2	65.2	63.0	62.5
Lowest temperature	27.0	29.3	25.0	35.0	29.0	22.0	31.0	34.2	27.5	30.0	19.0	31.0
Range of temperature	35.0	33.7	36.0	29.0	33.0	40.2	30.0	27.8	34.7	35.2	44.0	31.5
Greatest range of temperature	22.0	25.2	22.0	21.0	22.1	23.6	29.0	19.0	21.5	28.8	24.0	30.0
Least range of temperature	6.0	9.6	6.0	4.0	5.8	5.9	8.5	5.0	3.5	6.3	6.0	3.7
Average maximum temperature	55.4	53.7	50.7	55.0	53.3	49.5	55.9	52.7	52.0	57.7	49.9	53.6
Average minimum temperature	41.9	35.8	35.2	43.0	38.2	34.0	37.9	42.0	40.4	39.3	35.7	35.8
Mean range of temperature	13.5	17.9	15.5	12.0	15.1	15.6	18.0	10.7	11.6	18.4	14.2	17.8
Average humidity	79.0	72.0	78.9	82.3	69.7	82.7	80.8	88.2	89.6	73.3	80.2	78.1
Average dew point					34.7	36.6	40.7	43.7	42.6	39.6	36.8	3.76
Prevailing wind	S.E.	N.	S.E.	S.E.	N.	S.E.	S.E.	S.E.	S.E.	N.W.	N.& S.E.	N.W.
Total precipitation	9.26	3.18	1.64	6.14	1.89	2 23	3.43	2.16	7.95	1.12	4.81	0.15
Total velocity of wind	4,906	4,742	4,365	5,548	5,718	3,770	4,279	3,738	5,366	4,404	4,380	3,708
Maximum velocity of wind	28	33	34	32	32	36	30	18	44	26	36	27
Direction of maximum velocity	S.E.	N.	S.E.	S.E.	N.	N.W.	S.E.	S.E.	S.E.	N.W.	N.	N.W.
Clear days	8	11	18	10	17	17	13	9	14	21	8	18
Fair days	9	15	5	10	9	11	10	12	11	7	12	9
Cloudy days	14	5	8	11	5	3	8	10	6	3	11	4
Days rain fell	17	10	7	11	8	4	8	8	13	6	18	6
Foggy days	0	0	2	3	0	3	0	0	4	0	0	0
Electric storms	0	0	0	0	0	0	0	0	1	0	0	0
Solar halos	0	0	1	1	1	0	3	0	0	0	0	0
Lunar halos	0	0	3	1	1	0	2	0	0	0	0	1
Light frosts	3	5	4	9	10	3	1	6	3	3	0	8
Killing frosts	6	11	10	0	7	13	9	0	6	7	11	9
Days snow fell	0	1	1	0	0	0	0	0	0	0	3	0
Days temperature below 32°	5	7	8	0	2	11	2	0	4	3	12	5

Character of Weather Conditions for January, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperatures, between 65° in 1887 and 37° in 1888. Possible range in minima temperatures, between 54° in 1881–82 and 19° in 1888. Possible range of monthly mean temperatures, between 50° in 1878 and 42° in 1883. Clear days, one day in 2.3. Rain (or snow), one day in three, averaging 0.13 of an inch daily. Cloudy (including rainy) days, one day in three. Wind, hourly mean velocity of 6.3 miles; most frequent direction, from the southeast.

February Weather in Sacramento, from 1878 to 1889.—This table gives the mean average barometer, temperature, relative humidity, and dew point; the highest and lowest barometer and temperature, with the monthly range of each; the greatest and least daily range of temperature; the average, maximum, minimum, and range of temperature; prevailing wind; total rainfall; total and maximum velocity of wind, and the direction at time of maximum velocity; clear, fair, cloudy, and foggy days, and total number of days rain fell; solar and lunar halos; light and killing frosts; days snow fell; and number of days the minimum temperature was below 32°:

February:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Average barometer	29.96	30.10	30.19	30.11	30.17	30.14	30.04	30.14	30.08	30.02	30.08	30.11
Highest barometer	30.36	30.30	30.48	30.41	30.52	30.74	30.43	30.43	30.38	30.46	30.30	30.37
Lowest barometer	29.50	29.77	29.76	29.85	29.75	29.68	29.42	29.86	29.68	29.54	29.79	29.61
Range of barometer	0.86	0.53	0.72	0.56	0.77	1.06	1.01	0.57	0.70	0.92	0.51	0.76
Average temperature	51.3	55.0	46.0	53.5	46.3	46.0	46.9	54.0	53.3	44.7	52.6	50.3
Highest temperature	61.0	73.5	64.0	67.0	62.8	71.7	71.0	70.0	72.7	67.0	75.0	76.0
Lowest temperature	40.0	33.0	30.0	40.0	30.9	22.0	21.0	39.8	38.0	30.0	34.0	31.0
Range of temperature	21.0	40.5	34.0	27.0	31.9	49.7	50.0	30.2	34.7	37.0	41.0	45.0
Greatest range of temperature	16.0	28.5	28.0	19.0	23.3	28.0	25.6	21.5	23.0	25.2	28.5	35.0
Least range of temperature	5.0	5.5	9.0	5.0	9.0	11.0	7.0	8.0	7.0	7.2	10.0	9.0
Average maximum temperature	56.3	63.1	54.7	59.3	54.6	55.9	56.1	62.5	61.4	52.2	62.2	61.0
Average minimum temperature	45.6	45.6	36.4	47.7	38.3	35.9	38.9	46.4	47.1	37.4	43.7	39.3
Mean range of temperature	10.7	17.5	18.3	11.6	16.3	20.0	17.2	16.1	14.3	14.8	18.5	21.7
Average humidity	80.0	73.0	68.5	82.2	74.1	68.3	79.7	73.8	81.5	76.7	72.1	70.6
Average dew point					37.9	35.3	40.5	45.2	47.2	37.3	42.8	39.6
Prevailing wind	S.E.	N.	S.E.	S.E.	S.E.	N.	N.	N.W.	N.W.	S.	S.E.	S.E.
Total precipitation	8.04	3.88	1.83	5.06	2.40	1.11	4.46	0.49	0.29	6.28	0.57	0.33
Total velocity of wind	5,359	3,877	4,442	4,038	5,176	3,817	5,170	4,851	4,065	6,305	4,500	3,364
Maximum velocity of wind	36	33	32	22	27	23	33	31	32	33	36	36
Direction of maximum velocity	S.E.	N.	S.E.	S.W.	N.&S.E.	N.W.	S.	N.W.	N.W.	N.W.	N.W.	N.W.
Clear days	5	11	16	7	11	19	17	18	17	8	21	13
Fair days	8	11	4	11	11	8	5	8	11	11	7	12
Cloudy days	15	6	9	10	6	1	7	2	0	9	1	3
Days rain fell	17	9	10	13	10	4	10	6	3	14	5	5
Electric storms	0	0	0	0	0	0	0	0	0	0	0	0
Solar halos	0	0	0	0	1	0	0	0	0	0	1	0
Lunar halos	0	0	0	1	0	0	0	0	0	0	0	0
Light frosts	0	3	3	2	10	3	0	6	0	4	2	6
Killing frosts	0	2	7	0	3	13	8	0	0	6	3	3
Days snow fell	0	0	0	0	2	2	0	0	0	0	0	0
Days temperature below 32°	0	0	1	0	2	11	6	0	0	1	0	2

Character of Weather Conditions for February, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperatures, between 75° in 1888 and 40° in 1883. Possible range of minima temperatures, between 56° in 1879 and 1881 and 21° in 1884. Possible range of mean monthly temperatures, between 55° in 1879 and 45° in 1887. Clear days, one day in two. Rain (or snow), one day in three, averaging 0.11 of an inch daily. Cloudy (including rainy) days, one day in five. Wind, hourly mean velocity, 7 miles; most frequent direction, from the southeast.

March Weather in Sacramento, from 1878 to 1889.—This comparative weather table shows the average, highest, lowest, and range of barometer; the average, highest, lowest, and range of temperature; the greatest and least daily range of temperature; the average, maximum, minimum, and range of temperature; average relative humidity and dew point; the prevailing direction and total velocity of wind; maximum velocity, and direction at the time of maximum velocity; total rainfall; total number of clear, fair, cloudy, and foggy days, along with the number of days rain fell; thunder and lightning storms; solar and lunar halos; light and killing frosts; number of days the minimum temperature was below 32°.

March:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Average barometer	30.02	30.08	30.10	30.07	30.10	30.02	29.96	30.06	30.04	30.10	30.01	29.96
Highest barometer	30.39	30.33	30.36	30.41	30.38	30.24	30.30	30.37	30.35	30.32	30.48	30.28
Lowest barometer	29.61	29.73	29.76	29.68	29.71	29.62	29.51	29.80	29.63	29.88	29.64	29.41
Range of barometer	0.78	0.60	0.60	0.73	0.67	0.62	0.79	0.57	0.72	0.44	0.84	0.87
Average temperature	56.7	57.4	48.8	55.5	53.0	56.9	52.9	59.1	52.1	57.8	53.6	57.0
Highest temperature	72.0	75.0	72.0	79.0	80.0	78.2	70.5	77.0	72.0	78 7	76.5	76.0
Lowest temperature	40.0	38.0	29.0	37.0	34.1	42.5	39.0	45.8	37.7	40.7	37.0	41.0
Range of temperature	32.0	37.0	43.0	42.0	45.9	35.7	31.5	31.2	34.3	38.0	39.5	35.0
Greatest range of temperature	21.0	26.0	30.0	23.0	26.0	31.0	22.7	28.0	26.3	31.3	28.3	35.0
Least range of temperature	6.0	7.0	9.0	8.0	6.9	6.0	6.5	13.0	8.3	10.5	7.5	5.0
Average maximum temperature	63.6	64.8	59.5	64.0	62.5	69.3	60.7	70.5	60.8	69.4	62.7	66.3
Average minimum temperature	49.5	49.3	38.9	47.6	44.8	47.1	46.7	50.2	44.2	46.9	44.5	48.5
Mean range of temperature	14.1	15.5	20.6	16.4	17.7	22.2	14.0	20.3	16.6	22.6	18.2	17.8
Average humidity	74.0	74.0	60.1	68.3	64.2	71.4	76.3	65.2	70.6	67.6	67.7	76.2
Average dew point					39.8	46.9	45.2	46.4	41.7	46.2	42.0	48.3
Prevailing wind	S.	S.	S.E.	N.	N.	S.	N.	S.W.	N.W.	N.W.	N.W.	S.E.
Total precipitation	3.09	4.88	1.70	1.37	3.78	3.70	8.14	0.08	2.68	0.94	3.04	6.25
Total velocity of wind	4,135	4,757	6,470	4,804	6,396	4,688	6,787	5,312	6,567	4,469	6,736	5,273
Maximum velocity of wind	24	22	36	28	28	26	35	24	37	24	48	30
Direction of maximum velocity	N.	S.W.	N.	N.	S.E.&N.	S.E.	S.	N.W.& N.S.W.	N.W.	N.W.	S.E.	N.W.
Clear days	8	9	19	21	16	22	13	17	14	21	17	6
Fair days	11	12	7	5	6	5	7	11	12	8	8	12
Cloudy days	12	10	5	5	9	4	11	3	5	2	6	13
Days rain fell	14	15	8	7	13	6	15	2	12	6	9	14
Electric storms	0	0	0	0	0	0	0	0	1	0	0	2
Solar halos	1	0	1	0	0	0	0	0	0	2	0	1
Lunar halos	0	0	0	0	1	0	0	0	2	0	1	0
Light frosts	2	1	3	5	5	0	10	0	2	0	0	1
Killing frosts	0	0	3	0	0	0	0	0	0	0	0	0
Days temperature below 32°	0	0	1	0	0	0	0	0	0	0	0	0

Character of Weather Conditions for March, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperatures, between 80° in 1882 and 47° in 1888. Possible range of minima temperatures, between 59° in 1880–81 and 33° in 1880. Possible range of mean monthly temperatures, between 59° in 1885 and 49° in 1880. Clear days, one day in two. Rain (or snow), one day in three, averaging 0.10 of an inch daily. Cloudy (including rainy) days, one day in three. Wind, hourly mean velocity, 7.5 miles; most frequent direction, south.

April Weather in Sacramento, from 1878 to 1889.—The data contained in this table show the monthly average, the highest, lowest, and monthly range of the barometer; the monthly average, the highest, lowest, and monthly range of temperature; the greatest and least daily range of temperature; average maximum, minimum, and range of temperature; average relative humidity and dew point; total precipitation; prevailing direction, total, and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, with the total number of days rain fell; auroras; solar and lunar halos; light frosts.

April:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.
Average barometer	29.89	30.02	30.04	29.93	30.05	30.04	29.98	29.96	29.95	29.99	30.02	30.00
Highest barometer	30.21	30.32	30.25	30.22	30.29	30.43	30.25	30.20	30.24	30.26	30.27	30.28
Lowest barometer	29.56	29.79	29.55	29.78	29.80	29.68	29.62	29.52	29.63	29.70	29.81	29.79
Range of barometer	0.65	0.53	0.70	0.44	0.49	0.75	0.63	0.68	0.61	0.56	0.46	0.49
Average temperature	59.4	60.3	54.6	60.9	55.8	56.0	56.7	60.6	55.5	58.3	62.3	60.4
Highest temperature	78.0	83.0	78.0	84.0	82.2	76.0	74.2	83.0	79.7	83.5	89.0	84.0
Lowest temperature	41.0	44.6	40.0	44.0	40.5	39.8	40.0	39.0	39.0	41.2	42.7	42.0
Range of temperature	37.0	38.4	38.0	40.0	41.7	36.2	34.2	44.0	40.7	42.3	46.3	42.0
Greatest range of temperature	27.0	28.0	24.0	26.0	32.8	31.0	22.5	31.0	26.2	32.0	33.0	30.0
Least range of temperature	11.0	6.5	6.0	6.0	7.0	10.0	6.0	10.0	5.3	8.3	16.9	6.0
Average maximum temperature	68.1	69.7	62.6	71.8	65.9	66.5	65.8	71.3	65.4	69.5	76.7	71.3
Average minimum temperature	49.8	51.1	47.5	52.7	47.2	46.6	49.5	51.5	48.1	48.9	49.2	51.2
Average range of temperature	18.3	18.6	15.1	19.1	18.7	19.9	16.3	19.8	17.3	20.7	27.5	20.1
Average humidity	65.6	65.4	73.0	70.6	64.2	66.1	74.6	71.1	75.8	65.5	65.0	68.4
Average dew point					42.4	43.8	48.2	50.5	47.3	45.5	49.2	48.4
Prevailing wind	S.	S.	S.	S.	N.	S.	S.W.	S.W.	S.	N.W.	S.W.	S.W.
Total precipitation	1.07	2.66	14.20	1.64	1.99	0.67	4.32	0.68	4.08	2.53	0.10	0.26
Total velocity of wind	4,759	4,814	6,597	4,787	5,785	5,933	5,609	5,069	5,725	6,320	4,140	4,775
Maximum velocity of wind	32	32	34	22	35	34	27	23	36	30	24	24
Direction of wind of maximum velocity	N.W.	N.	S.	S.	N.	N.W.	S.E.	S.	N.W.	N.W. & S.E.	S.W.	S.W. & N.W.
Clear days	15	14	10	17	16	16	13	14	13	20	23	8
Fair days	12	9	10	9	9	13	7	12	12	7	5	15
Cloudy days	3	7	10	4	5	1	10	4	5	3	2	7
Days rain fell	4	12	16	8	9	8	9	7	12	10	2	11
Electric storms	0	0	0	0	0	0	0	0	0	0	0	0
Auroras	0	0	0	0	1	0	0	0	0	0	0	0
Solar halos	0	1	1	0	1	3	3	0	3	0	1	0
Lunar halos	0	0	1	0	1	0	2	0	0	0	1	0
Light frosts	0	1	0	0	1	2	0	4	2	1	0	0

Character of Weather Conditions for April, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperatures, between 89° in 1888 and 51° in 1880. Possible range of minima temperatures, between 60° in 1885 and 39° in 1885. Possible range of mean monthly temperatures, between 62° in 1888 and 55° in 1880. Clear days, one day in two. Rain, three days in ten, averaging 0.11 of an inch daily. Cloudy (including rainy) days, one day in six. Wind, hourly mean velocity, 8 miles; most frequent direction, south.

May Weather in Sacramento, from 1878 to 1888.—The meteorological record of the following table consists of the average monthly, the highest, lowest, and monthly range of barometer; average monthly, the highest, lowest, and monthly range of temperature; greatest and least daily range of temperature; average, maximum, minimum, and range of temperature; average relative humidity and dew point; total precipitation; prevailing, total, and maximum velocity of wind; the direction at the time of maximum velocity; total number of clear, fair, and cloudy days, with the total number of days rain fell; light frosts; solar and lunar halos; number of days the maximum temperature was above 90°:

MAY:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.91	30.05	30.03	29.93	29.96	29.97	29.96	29.89	30.00	29.96	29.91
Highest barometer	30.11	30.27	30.24	30.12	30.19	30.27	30.12	30.04	30.19	30.25	30.09
Lowest barometer	29.62	29.84	29.79	29.77	29.75	29.74	29.75	29.69	29.78	29.71	29.74
Range of barometer	0.49	0.43	0.45	0.35	0.44	0.53	0.37	0.35	0.41	0.54	0.35
Average temperature	65.5	60.2	61.6	64.8	64.0	62.6	64.0	65.7	62.0	62.9	61.8
Highest temperature	91.0	91.0	86.0	88.8	94.6	98.0	85.0	98.0	94.0	97.7	90.0
Lowest temperature	47.0	43.0	39.0	48.5	40.0	42.2	50.5	49.5	44.5	39.0	45.5
Range of temperature	44.0	48.0	47.0	40.3	54.6	55.8	34.5	48.5	49.5	58.7	44.5
Greatest range of temperature	29.0	32.0	26.0	31.6	31.5	33.5	25.0	33.0	35.5	35.0	33.5
Least range of temperature	11.0	10.0	11.0	15.3	15.1	9 5	12.5	15.0	8.5	13.2	13.5
Average maximum temperature	76.7	71.3	71.5	78.5	76.8	73.7	75.4	79.8	75.4	75.9	75.1
Average minimum temperature	54.6	50.4	52.6	54.7	53.1	53.5	55.7	54.8	52.2	50.5	50.3
Average range of temperature	22.1	20.9	18.9	23.8	23.7	20.2	19.7	25.0	23.2	25.3	24.8
Average humidity	57.0	59.0	60.8	55.8	57.2	69.2	69.0	58.6	69.2	62.9	67.9
Average dew point					46.7	51.3	53.1	49.5	51.0	48.8	49.9
Prevailing wind	S.	S.W.	N.W.	S.	S.W.	S.	S.	S.W.	S.W.	S.W.	S.W.
Total precipitation	0.17	1.30	0.76	spr.	0.35	2.85	0.06	spr.	0.07	spr.	0.40
Total velocity of wind	5,068	4,959	6,586	5,428	5,593	5,204	5,772	6,289	5,467	6,422	5,934
Highest velocity of wind	40	32	32	25	25	28	26	30	27	29	24
Direction at highest velocity	N.	N.	N.W.	N.	N.W.	N.W.	S.W.	N.W.	N.W.	N.W.	S.W
Clear days	22	16	20	22	25	16	19	26	23	21	19
Fair days	5	13	7	8	4	8	9	5	6	9	10
Cloudy days	4	2	4	1	2	7	3	0	2	1	2
Days rain fell	3	5	3	1	3	10	3	1	2	1	3
Electric storms	0	0	0	0	0	0	0	0	0	0	1
Light frosts	0	0	0	0	4	2	0	0	0	2	0
Solar halos	0	0	1	0	0	2	2	0	3	3	1
Lunar halos	0	0	0	0	0	0	1	0	0	0	0
Days temperature above 90°	1	1	0	0	2	2	0	4	1	3	0

Character of Weather Conditions for May, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperature, between 98° in 1883, 1885, and 1887, and 55° in 1880. Possible range of minima temperature, between 68° in 1883 and 39° in 1880. Possible range of mean monthly temperature, between 66° in 1885 and 60° in 1879. Clear days, one day in 1.5. Rain, one day in ten, averaging 0.018 of an inch daily. Cloudy (including rainy) days, one day in ten. Wind, hourly mean velocity, 7.6 miles; most frequent direction, southwest.

June Weather in Sacramento, from 1878 to 1888.—The recorded data below give the monthly average barometer, along with the highest, lowest, and monthly range of barometer; the average monthly temperature, with the highest, lowest, and monthly range of temperature; the greatest and least daily range of temperature; the mean maximum, minimum, and average range of temperature; average relative humidity and dew point; the prevailing direction, total and maximum velocity of wind, along with the direction at the time of maximum velocity; the total number of clear, fair, and cloudy days, and the number of days rain fell; solar and lunar halos; total number of days the maximum temperature was above 90°:

JUNE:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.83	29.84	29.92	29.91	29.88	29.91	29.95	29.94	29.87	29.82	29.90
Highest barometer	30.12	30.08	30.19	30.11	30.08	30.20	30.14	30.12	30.06	30.04	30.11
Lowest barometer	29.67	29.65	29.73	29.70	29.72	29.63	29.77	29.73	29.65	29.55	29.71
Range of barometer	0.45	0.43	0.46	0.41	0.36	0.57	0.37	0.39	0 41	0.49	0.40
Average temperature	71.8	72.1	66.6	66.2	68.1	72.6	65.8	66:2	69.0	69.1	67.7
Highest temperature	99.0	100.0	88.0	93.5	94.6	102.5	92.0	91.0	97.7	100.0	96.0
Lowest temperature	49.0	52.0	51.0	48.0	51.2	49.8	52.9	51.0	51.5	47.0	48.5
Range of temperature	50.0	48.0	37.0	45.5	43.4	52.7	39.1	40.0	46.2	53.0	47.5
Greatest range of temperature	36.0	33.0	30.0	31.9	33.4	36.0	30.0	34.0	35.5	37.0	38.7
Least range of temperature	17.0	17.0	14.0	13.1	15.0	15.1	8.5	13.0	15.0	17.1	11.0
Mean maximum temperature	86.0	85.7	79.9	80.5	82.7	88.1	76.3	79.9	85.3	84.4	80.8
Mean minimum temperature	58.4	59.8	55.8	56.0	56.4	60.1	57.6	55.9	57.0	55.1	55.2
Mean range of temperature	27.6	25.9	24.1	24.5	26.3	28.0	18.7	24.0	28.3	29.4	25.5
Average humidity	53.0	50.4	52.3	54.9	59.3	59.5	69.8	59.0	60.4	59.2	59.5
Average dew point					52.1	56.4	55.1	50.4	53.5	52.6	51.6
Prevailing wind	S.	S.	S.	S.	S.	S.	S.	S.W.	S.	S.W.	S.W.
Total precipitation	none	0.13	none	0.50	0.10	none	1.45	0.11	none	none	0.08
Total velocity of wind	4,874	5,062	5,947	5,684	5,529	5,928	5,506	6,716	5,837	5,791	5,494
Maximum velocity of wind	20	26	22	22	23	31	22	24	42	30	36
Direction of maximum velocity	N.W.	N.	S.	S.W.	S.	N.W.	S.W.	S.W.	N.W.	S.W.	S.W.
Clear days	27	23	29	24	25	28	18	24	30	24	17
Fair days	3	7	1	5	4	2	5	5	0	6	9
Cloudy days	0	0	0	1	1	0	7	1	0	0	4
Days rain fell	0	1	0	2	1	0	7	2	0	0	7
Electric storms	0	0	0	0	0	0	0	0	0	0	0
Solar halos	0	0	0	0	1	2	0	1	0	1	7
Lunar halos	0	0	0	0	0	0	0	0	0	0	0
Number of days temperature was above 90°	6	10	0	2	5	11	1	2	5	8	2

Character of Weather Conditions for June, as Shown by Observations of the Past Eleven Years.—Possible range of maxima temperatures, between 102° in 1883 and 62° in 1884. Possible range of minima temperatures, between 72° in 1883–87 and 47° in 1887. Possible range of mean monthly temperatures, between 73° in 1883 and 66° in 1881, 1884, and 1885. Clear days, one day in 1.2. Rain, one day in thirty, averaging 0.008 of an inch daily. Cloudy (including rainy) days, one day in thirty. Wind, hourly mean velocity, 7.9 miles; most frequent direction, south.

July Weather in Sacramento, from 1877 to 1888.—In this table will be found the monthly average, highest, lowest, and monthly range of barometer; the monthly average, highest, lowest, and monthly range of temperature; the greatest and least daily range of temperature; the average, maximum, minimum, and range of temperature; average relative humidity and dew point; total precipitation; the prevailing direction, total, and maximum velocity of wind, along with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and number of days rain fell; solar halos; number of days the maximum temperature was above 90°:

JULY:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.82	29.83	29.85	29.88	29.91	29.91	29.89	29.92	29.90	29.84	29.89	29.90
Highest barometer	29.99	29.97	30.02	30.02	30.14	30.10	30.10	30.10	30.10	30.05	30.11	30.21
Lowest barometer	29.64	29.71	29.67	29.69	29.72	29.74	29.64	29.78	29.70	29.67	29.74	29.75
Range of barometer	0.25	0.26	0.35	0.33	0.42	0.36	0.46	0.32	0.40	0.38	0.37	0.46
Average temperature	75.0	73.4	71.8	70.9	71.1	73.4	73.1	71.2	71.0	72.0	70.2	71.6
Highest temperature	103.0	98.0	100.0	98.0	98.6	97.8	103.5	96.0	98.0	105.0	99.2	104.0
Lowest temperature	52.0	52.0	51.0	55.0	51.9	55.9	56.0	54.5	56.0	52.2	48·0	51.0
Range of temperature	51.0	46.0	49.0	43.0	46.7	41.9	47.5	41.5	42.0	52.8	51.2	53.0
Greatest range of temperature	39.0	38.0	34.0	34.0	35.7	35.6	37.0	31.8	35.0	37.8	40.0	39.0
Least range of temperature	15.0	17.0	21.0	21.0	19.5	21.6	22.0	15.1	16.0	24.5	25.5	19.0
Mean maximum temperature	91.4	88.5	87.6	86.3	87.1	90.1	90.6	85.4	86.2	89.7	88.3	89.5
Mean minimum temperature	60.0	58.8	57.6	59.1	59.2	60.6	60.7	60.1	59.7	58.9	54.3	57.3
Mean range of temperature	31.4	29.7	30.0	27.2	27.9	29.5	29.9	25.3	26.5	30.8	34.0	32.2
Average humidity	43.0	50.7	51.5	55.9	51.2	54.4	57.8	59.4	55.1	60.2	59.1	57.2
Average dew point	------	------	------	------	------	54.5	56.3	55.5	52.9	56.3	53.9	52.6
Prevailing wind	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Total precipitation	spr.	none	spr.	spr.	spr.	spr.	none	none	spr.	none	none	spr.
Total velocity of wind	4,572	4,445	4,602	5,333	5,579	5,443	5,084	5,778	6,594	4,850	5,589	5,905
Maximum velocity of wind	20	15	15	18	20	28	17	24	25	20	24	24
Direction of maximum velocity	S.	S.	S.W.	N.W.	N.W.	N.W.	S.W.	S.W.	S.	S.W.	S.,S.W.	S.,S.W.
Clear days	29	31	29	26	31	31	31	29	27	30	31	29
Fair days	1	0	2	5	1	0	0	2	4	1	0	2
Cloudy days	1	0	0	0	0	0	0	0	0	0	0	0
Days rain fell	1	0	1	2	1	2	0	0	1	0	0	2
Electric storms	0	0	0	0	0	0	0	0	0	0	0	0
Solar halos	0	0	0	0	0	0	1	0	1	0	0	1
Lunar halos	0	0	0	0	0	0	0	0	0	0	0	0
Number of days temperature was above 90°	20	14	11	5	10	15	12	7	9	13	13	15

Character of Weather Conditions for July, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures, between 105° in 1886 and 74° in 1879, 1881, and 1885. Possible range of minima temperatures, between 74° in 1886 and 48° in 1887. Possible range of mean monthly temperatures, between 75° in 1877 and 70° in 1887. Clear days, one day in 1.04.

August Weather in Sacramento, from 1877 to 1888.—The meteorological data contained in the following report show the monthly average barometer; highest, lowest, and monthly range of barometer; monthly average temperature; the highest, lowest, and monthly range of temperature; greatest and least daily range of temperature; monthly average, maximum, minimum, and range of temperature; average relative humidity and dew point; total rainfall; prevailing direction, total velocity, and maximum velocity of wind, along with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and number of days rain fell; number of days the maximum temperature was above 90°:

August:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.89	29 82	29.80	29.84	29.89	29.89	29.92	29.89	29.83	29.83	29.80	29.85
Highest barometer	30.06	30.06	30.03	30 05	30.14	30.09	30.09	30.09	29.98	29.97	29.96	30.04
Lowest barometer	29.76	29.63	29.62	29.58	29.72	29.73	29.77	29.73	29.64	29.70	29.63	29.63
Range of barometer	0.30	0 43	0.41	0.47	0.42	0.36	0.32	0.36	0.34	0.27	0.33	0.41
Average temperature	72.9	73.4	74.7	69.7	68.2	71.9	71.4	72.5	73.0	71.6	69.1	75.4
Highest temperature	95.0	100.5	103.0	97.0	94.6	99.8	100.0	100.0	105.0	102.0	99.7	107.5
Lowest temperature	54.0	53.0	54.0	49.0	51.0	55.0	54.8	54.0	51.5	53.2	48.0	51.0
Range of temperature	41.0	47.5	49.0	48.0	43.6	44.8	45.2	46.0	53.5	48.8	51.7	56.5
Greatest range of temperature	39 0	35.0	40.0	33.0	35.3	35.6	38.5	33.8	42.0	42 8	43.0	43.0
Least range of temperature	23.0	18.0	19.0	19.0	21.7	23.0	19.0	20.5	21.5	23.0	22.0	25.0
Mean maximum temperature	89.7	88.2	90.9	85.4	84.6	89.4	88.9	88.7	91.9	90.4	86.6	94.5
Mean minimum temperature	56.4	58.9	60.4	57.0	56.0	58.6	59.2	60.8	59.8	58.4	53.6	59.2
Mean range of temperature	33.3	29.3	30.5	28.4	28.6	30.8	29.7	27.9	32.1	32.0	33.0	35.3
Average humidity	46.0	52.0	49.2	56.1	56.9	57.3	57.8	60.8	53.2	57.8	60.7	55.0
Average dew point						54.7	54.4	57.5	53.3	54.8	53.5	54.8
Prevailing wind	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Total precipitation	spr.	none	spr.	none	none	none	none	spr.	none	none	spr.	spr.
Total velocity of wind	3,650	3,984	3,981	4,786	5,189	4,477	4,597	5,234	5,164	4,233	5,085	4,226
Maximum velocity of wind	20	13	14	20	19	16	18	18	18	18	24	18
Direction of maximum velocity	S.	S.	S. & N.	S.	S.W.	S.	N.W.	S.W.	S.W.	S.W.	S.	S.W. & S.E.
Clear days	31	25	29	30	31	31	30	29	30	31	31	30
Fair days	0	6	2	1	0	0	1	2	1	0	0	1
Cloudy days	0	0	0	0	0	0	0	0	0	0	0	0
Days rain fell	1	0	1	0	0	0	0	1	0	0	1	1
Electric storms	0	0	0	0	0	0	0	0	0	0	0	0
Solar halos	0	0	0	0	0	0	0	0	0	0	0	1
Lunar halos	0	0	0	0	0	0	0	0	0	0	0	0
Number of days temperature above 90°	16	10	17	7	4	12	11	13	19	17	10	23

Character of Weather Conditions for August, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures between 108° in 1888 and 73° in 1878. Possible range of minima temperatures, between 74° in 1885 and 48° in 1887. Possible range of monthly mean temperatures, between 75° in 1879–1888 and 68° in 1881. Clear days, one day in 1.04. Rain, one day in thirty-one, averaging a sprinkle. Cloudy (including rainy) days, no cloudy days in twelve years. Wind, hourly mean velocity, 6 miles per hour; prevailing direction, from the south.

September Weather in Sacramento, from 1877 to 1888.—The following table gives the monthly average barometer; the highest, lowest, and monthly range of barometer; the monthly average temperature; the highest, lowest, and monthly range of temperature; the greatest and least daily ranges of temperature; the monthly average, maximum, minimum, and range of temperature; the average relative humidity and dew point; total rainfall; the prevailing direction, total and maximum velocity of wind, with the direction at time of the maximum velocity; total number of clear, fair, and cloudy days, with number of days rain fell; solar and lunar halos; number of days the maximum temperature was above 90°:

SEPTEMBER:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.85	29.92	29.91	29.92	29.89	29.93	29.90	29.93	29.86	29.87	29.87	29.84
Highest barometer	30.10	30.12	30.05	30.06	30.16	30.19	30.05	30.16	29.97	30.04	30.04	30.04
Lowest barometer	29.70	29.77	29.77	29.73	29.61	29.77	29.72	29.62	29.74	29.77	29.65	29.58
Range of barometer	0.40	0.35	0.28	0.33	0.55	0.42	0.33	0.54	0.23	0.27	0.39	0.46
Average temperature	72.8	69.0	70.5	68.0	67.8	68.4	71.6	64.8	69.8	67.9	70.4	7.37
Highest temperature	98.0	92.0	96.0	92.0	96.1	99.6	101.0	93.5	98.5	96.0	100.0	106.0
Lowest temperature	49.0	48.0	52.0	48.0	50.0	44.4	52.9	49.0	50.5	49.0	45.7	50.5
Range of temperature	49.0	44.0	44.0	44.0	46.1	55.2	48.1	44.5	48.0	47.0	54.3	55.5
Greatest range of temperature	40.0	34.0	37.0	35.0	37.7	36.5	40.0	33.0	41.8	40.0	39.5	42.0
Least range of temperature	19.0	12.0	19.0	23.0	12.8	5.2	10.0	19.0	14.0	20.0	16.2	14.0
Mean maximum temperature	87.6	81.6	85.3	83.2	82.1	82.7	87.3	79.5	88.2	86.0	86.3	91.4
Mean minimum temperature	57.3	55.6	57.3	54.9	55.5	56.8	59.6	53.5	56.3	55.0	55.3	59.5
Mean range of temperature	30.3	26.0	28.0	28.3	26.6	25.9	27.7	26.0	31.9	31.0	31.0	31.9
Average humidity	43.0	51.0	54.4	54.9	52.8	59.4	57.6	63.4	52.6	59.0	53.3	56.2
Average dew point					48.5	52.0	54.6	51.2	49.4	51.5	50.9	54.3
Prevailing wind	S.	S.	S.	S.	S.	S.E. & S.	S.	S.	S.	S.	N.W.	S.
Total precipitation	none	0.29	none	none	0.30	0.57	0.90	0.60	0.08	none	0.02	0.55
Total velocity of wind	4,009	4,051	3,395	4,014	4,694	3,905	3,657	4,847	4,468	3,364	4,052	4,033
Maximum velocity of wind	20	24	22	16	22	27	16	27	20	26	24	24
Direction of maximum velocity	N.W.	N.	N.W.	N.	N.W.	N.W.	S.W. & S.	N.W.	N.W.	N.W.	N.W. & S.W.	S.W. & N.E.
Clear days	30	23	23	28	26	26	24	27	27	30	23	24
Fair days	0	6	7	1	4	3	5	3	3	0	7	3
Cloudy days	0	1	0	1	0	1	1	0	0	0	0	3
Days rain fell	0	3	0	0	1	2	3	4	1	0	3	3
Electric storms	0	0	0	0	0	0	0	0	0	0	1	2
Solar halos	0	0	1	1	0	1	0	0	1	0	2	0
Lunar halos	0	0	0	0	0	0	0	0	0	0	0	0
Number of days temperature above 90°	12	4	10	4	5	8	8	1	11	9	10	17

Character of Weather Conditions for September, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures, between 106° in 1888 and 61° in 1882. Possible range of minima temperatures, between 70° in 1888 and 44° in 1884. Possible range of monthly mean temperatures, between 74° in 1888 and 65° in 1884. Clear days, one day in 1.2. Rain, one day in thirty, averaging .009 of an inch daily. Cloudy (including rainy) days, one day in thirty. Wind, hourly mean velocity, 6 miles per hour; most frequent direction, south.

October Weather in Sacramento, from 1877 to 1888.—The weather changes, etc., in the following review show the monthly average barometer; the highest, lowest, and monthly range of barometer; monthly average temperature; the highest, lowest, and monthly range of temperature; greatest and least daily range of temperature; highest, lowest, and range of temperature; mean maximum, minimum, and range of temperature; the average relative humidity and dew point; total rainfall; prevailing direction, total, and maximum velocity of wind, and the direction at the time of maximum velocity; total number of clear, fair, and cloudy days, with total number of days rain fell; solar and lunar halos; light frosts; number of days maximum temperature was above 90°:

October:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.97	29.98	30.01	30 02	30.03	30.02	30.00	29.99	29.95	30.02	29.96	29.93
Highest barometer	30.16	30.23	30.28	30.23	30.30	30.28	30.31	30.19	30.14	30.28	30.21	30.13
Lowest barometer	29.83	29.68	29.66	29.74	29.79	29.80	29.62	29.74	29.68	29.80	29.74	29.76
Range of barometer	0.33	0.55	0.62	0.49	0.51	0.48	0.69	0.45	0.46	0.48	0.47	0.37
Average temperature	62.9	62.9	61.5	62.1	56.8	58.4	58.2	59.9	64.3	57.1	66.5	64.2
Highest temperature	88.0	86.0	87.0	85.0	81.0	76.8	81.0	80.5	98.0	85.5	92.0	91.5
Lowest temperature	38.0	40.0	40.0	46.0	36.4	38.8	42.2	42.0	40.0	38.5	42.0	40.0
Range of temperature	50.0	46.0	37.0	39.0	44.6	38.0	38.8	38.5	58.0	47.0	50.0	51.5
Greatest range of temperature	32.0	34.0	34.0	31.0	35.0	27.1	28.0	31.0	39.3	36.0	38.0	35.0
Least range of temperature	11.0	5.0	14.0	12.0	7.1	7.0	10.1	3.5	19.0	6.0	17.7	19.0
Mean maximum temperature	70.2	75.3	74.0	75.0	68.7	68.6	69.5	72.1	79.9	70.9	81.2	79.7
Mean minimum temperature	50.2	48.6	48.9	49.8	46.5	49.0	48.4	49.6	51.4	46.7	51.6	50.8
Mean range of temperature	20.0	26.7	25.1	25.2	22.2	19.6	21.1	22.5	28.5	24.2	29.6	28.9
Average humidity	49.0	54.0	63.1	54.3	62.6	72.5	71.2	71.2	62.3	69.7	46.0	62.0
Average dew point					42.2	48.7	48.0	49.8	49.1	46.2	42.6	48.8
Prevailing wind	N.	N.	S.	N.	S.	S.	S.	S.E.&N.	N.W.	N.W.	N.W.	S.E.
Total precipitation	0.73	0.55	0.88	none	0.55	2.63	0.97	2.01	0.02	0.68	none	none
Total velocity of wind	4,044	4,078	3,077	3,656	4,538	3,897	3,988	3,495	3,761	3,583	4,624	4,682
Maximum velocity of wind	28	28	16	18	19	28	21	20	18	17	33	36
Direction of maximum velocity	N. & N.W.	N.	N.W.	S.W. & N.W.	S.W. & N.	S.E.	S. E.	S.W.	S.W.	N.W.	N.W.	N.W.
Clear days	27	28	23	23	22	19	19	26	20	22	28	28
Fair days	0	1	5	7	8	10	9	4	9	9	3	3
Cloudy days	4	2	3	1	1	2	3	1	2	0	0	0
Days rain fell	5	1	4	0	7	7	8	5	3	5	0	0
Solar halos	0	0	1	1	0	0	0	0	1	1	0	1
Lunar halos	0	0	1	0	0	0	0	1	0	0	0	0
Electric storms	0	0	0	0	0	0	0	0	1	0	0	0
Light frosts	2	1	0	0	3	8	10	3	0	0	0	2
Number of days temperature above 90°	0	0	0	0	0	0	0	0	4	0	4	1

Character of Weather Conditions for October, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures between 98° in 1885 and 50° in 1886. Possible range of minima temperatures between 64° in 1887 and 36° in 1881. Possible range of mean monthly temperatures between 66° in 1887 and 40° in 1888. Clear days, one day in 1.3. Rainy days, one day in eight, averaging .026 of an inch daily. Cloudy days, one day in eight. Wind, hourly mean velocity of 5 miles; most frequent direction, north.

November Weather in Sacramento, from 1877 to 1888.—This meteorological table shows the monthly average barometer; highest, lowest, and monthly range of barometer; monthly average temperature; the greatest and least daily range of temperature; mean maximum, minimum, and range of temperature; monthly average relative humidity and dew point; total precipitation; prevailing direction, total and maximum velocity of wind, and direction at the time of maximum velocity; total number of clear, fair, and cloudy days, and total number of days rain fell; solar and lunar halos; light and killing frosts; number of days the minimum temperature was below 32°:

NOVEMBER:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	30.11	30.09	30.10	30.16	30.16	30.12	30.13	30.08	29.98	30.15	30.04	30.01
Highest barometer	30.34	30.47	30.41	30.49	30.44	30.45	30.41	30.27	30.27	30.37	30.31	30.20
Lowest barometer	29.82	29.78	29.38	29.83	29.92	29.84	29.93	29.79	29.46	29.58	29.73	29.69
Range of barometer	0.52	0.69	1.03	0.66	0.52	0.61	0.48	0.48	0.81	0.79	0.58	0.51
Average temperature	54.7	55.5	50.9	49.7	50.8	49.5	50.5	55.3	54.4	50.4	54.7	53.6
Highest temperature	70.0	72.0	70.0	76.0	71.0	65.6	71.0	75.2	77.0	74.2	75.2	75.0
Lowest temperature	37.0	34.0	33.0	27.0	32.0	34.0	29.0	37.7	38.5	32.2	28.0	32.2
Range of temperature	33.0	38.0	37.0	49.0	39.0	31.6	42.0	37.5	38.5	42.0	47.2	42.8
Greatest range of temperature	27.0	31.0	28.0	36.0	28.1	22.6	28.0	29.5	28.2	34.2	35.5	35.0
Least range of temperature	8.0	10.0	8.0	7.0	8.0	41.8	6.6	16.0	4.3	6.2	10.0	4.0
Mean maximum temperature	62.6	65.3	60.6	60.7	61.1	57.8	62.1	67.6	61.6	63.0	67.5	64.2
Mean minimum temperature	44.4	43.2	41.0	38.0	40.1	41.3	40.1	44.7	48.2	38.6	41.6	43.9
Mean range of temperature	18.2	22.1	19.6	22.7	21.0	16.5	22.0	22.9	13.4	24.4	25.9	20.3
Average humidity	72.0	66.0	73.5	51.6	61.8	76.9	77.5	72.6	84.1	64.9	62.8	71.2
Average dew point					36.6	41.9	43.4	46.1	49.2	37.6	41.1	42.8
Prevailing wind	N.	N.	N.	N.	N.	N.W.	S.E.	N.	S.E.	N.W.	N.W.	S.E.
Total precipitation	1.07	0.51	2.05	0.05	1.88	3.22	0.61	none	11.34	0.21	0.45	4.28
Total velocity of wind	2,616	3,140	4,020	3,848	3,761	3,411	3,126	2,317	5,985	3,685	3,190	3,487
Maximum velocity of wind	23	32	36	28	24	32	25	22	36	36	27	21
Direction of maximum velocity	N.	N.	N.	N.	N.	N.W.	N.W.	S.E.	S.E.	N.W.	N.W.	N.W.
Clear days	18	20	13	20	25	16	24	22	4	26	24	17
Fair days	6	9	8	6	3	9	4	6	11	3	3	7
Cloudy days	6	1	9	4	2	5	2	2	15	1	3	6
Days rain fell	8	3	9	2	4	7	3	0	21	2	4	9
Solar halos	0	0	0	0	0	0	0	1	0	0	0	0
Lunar halos	1	0	1	0	0	0	0	3	0	0	0	0
Light frosts	1	5	5	4	8	18	9	14	3	20	5	3
Killing frosts	0	3	4	12	3	0	6	0	0	2	3	0
Number of days temperature below 32°	0	0	0	9	0	0	2	0	0	0	2	0

Character of the Weather Conditions for November, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures between 77° in 1885 and 45° in 1880. Possible range of minima temperatures between 58° in 1885 and 27° in 1880. Possible range of mean monthly temperatures between 56° in 1878 and 50° in 1882. Clear days, one day in 1.6. Rainy days, one day in six, averaging .065 of an inch daily. Cloudy days, one day in 4.5. Wind, hourly mean velocity of 5 miles; most frequent direction, north.

December Weather in Sacramento, from 1877 to 1888.—The weather review in the following table shows the monthly average barometer; highest, lowest, and monthly range of barometer; the monthly average temperature; highest, lowest, and monthly range of temperature; the greatest and least daily range of temperature; the mean maximum, minimum, and range of temperature; the average relative humidity and dew point; total precipitation; prevailing direction, total, and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, cloudy, and foggy days, and total number of days rain fell; solar and lunar halos; light and killing frosts; number of days the minimum temperature was below 32°:

DECEMBER:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	30.05	30.13	30.13	30.04	30.20	30.18	30.18	29.96	30.14	30.16	30.13	30.07
Highest barometer	30.38	30.51	30.68	30.46	30.41	30.38	30.49	30.30	30.35	30.40	30.35	30.33
Lowest barometer	29.66	29.78	29.47	29.48	29.88	29.77	29.72	29.49	29.77	29.86	29.50	29.49
Range of barometer	0.72	0.73	1.21	0.98	0.53	0.61	0.77	0.81	0.58	0.54	0.85	0.84
Average temperature	48.6	47.2	44.0	50.3	46.2	48.2	44.2	48.8	49.1	49.2	46.9	48.4
Highest temperature	67.0	66.3	63.0	63.0	62.0	68.0	67.0	65.0	64.7	65.2	65.0	63.0
Lowest temperature	32.0	23.5	25.0	38.0	31.9	27.0	24.0	27.0	37·7	32.0	29.0	36.0
Range of temperature	35.0	42.8	38.0	25.0	30.1	41.0	43.0	38.0	27.0	33.2	36.0	27.0
Greatest range of temperature	27.0	28.5	21.0	13 0	20.9	23.2	31.0	27.5	16.0	32.2	31.5	20.0
Least range of temperature	6.0	13.0	7.0	3.0	5.0	7.5	6.5	5.0	2.8	5.5	7.5	3.0
Mean maximum temperature	56.3	57.2	50.4	54.4	52.7	55.7	53.3	56.2	53.8	57.6	55.6	53.2
Mean minimum temperature	39.3	34.7	36.5	45.4	39.6	40.1	36.4	41.6	45.0	42.2	37.6	43.7
Mean range of temperature	17.0	22.5	13.9	9.0	13.1	15.6	16.9	14.6	8.8	15.4	18.0	9.5
Average humidity	74.0	55.0	84.0	87.9	85.5	82.4	88.5	71.1	90.3	82.9	77.6	91.1
Average dew point					41.7	42.6	40.7	38.9	40.2	43.8	39.7	45.8
Prevailing wind	N.	N.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.	S.E.
Total precipitation	1.43	0.47	3.41	11.81	3.27	1.13	0.44	10.45	5.76	2.21	2.09	4.63
Total velocity of wind	3,187	4,031	4,928	6,453	3,717	3,544	2,845	7,817	4,458	3,294	5,064	3,447
Maximum velocity of wind	16	30	39	40	24	19	16	36	25	25	40	36
Direction of maximum velocity	S.	N.	S.	S.E.	S.E.	W.S.E. & S.W.	W.	N.W.	N.W.	S.E.	S.E.	S.E.
Clear days	13	22	11	3	15	16	17	13	11	12	15	5
Fair days	11	5	8	5	9	11	10	8	7	11	13	7
Cloudy days	7	4	12	23	7	4	4	10	13	8	3	18
Foggy days	0	0	4	3	5	1	8	0	3	0	0	0
Days rain fell	5	4	12	22	12	8	8	14	10	8	10	16
Days snow fell	0	0	0	0	0	1	0	0	0	0	0	0
Solar halos	0	0	0	0	1	0	0	0	0	1	0	1
Lunar halos	0	0	0	0	0	0	0	0	1	0	0	0
Light frosts	6	7	2	0	7	13	4	13	5	3	3	4
Killing frosts	6	13	8	0	1	2	8	5	0	2	10	0
Number of days temperature below 32°	0	10	8	0	1	1	3	4	0	0	3	0

Character of Weather Conditions for December, as Shown by Observations of the Past Twelve Years.—Possible range of maxima temperatures, between 68° in 1882 and 37° in 1882. Possible range of minima temperatures between 56° in 1884 and 24° in 1878 and 1883. Possible range of mean monthly temperatures, between 50° in 1880 and 44° in 1879 and 1883. Clear days, one day in two. Rainy days, one in three, averaging .12 of an inch daily. Cloudy days, one day, in three. Wind, hourly mean velocity of 6 miles; most frequent direction, southeast.

Comparative Winter Weather in Sacramento, from 1877-78 to 1888-89.—This table of winter comparisons shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; the average relative humidity, and the average dew point; total rainfall; prevailing wind; total and maximum velocity, with the direction of wind at the time of maximum velocity; total number of clear, fair, cloudy, and foggy days, and total number of days rain fell; number of snow storms; solar and lunar halos; light and killing frosts; number of days the temperature was below 32°:

Winter of:	1877-78.	1878-79.	1879-80.	1880-81.	1881-82.	1882-83.	1883-84.	1884-85.	1885-86.	1886-87.	1887-88.	1888-89.
Average barometer	30.00	30.12	30.16	30.12	30.17	30.19	30.12	30.09	30.10	30.11	30.15	30.10
Highest barometer	30.38	30.51	30.68	30.46	30.52	30.74	30.58	30.43	30.40	30.51	30.63	30.37
Lowest barometer	29.46	29.77	29.47	29.48	29.75	29.68	29.42	29.49	29.32	29.54	29.50	29.49
Range of barometer	0.92	0.74	1.21	0.98	0.77	1.06	1.16	0.94	1.08	0.99	1.13	0.88
Average temperature	49.9	49.2	44.5	51.0	45.9	45.4	45.9	50.0	49.4	47.5	47.4	47.8
Highest temperature	67.0	73.5	64.0	67.0	62.8	71.7	71.0	70.0	72.7	67.0	75.0	76.0
Lowest temperature	27.0	23.5	25.0	35.0	29.0	22.0	21.0	27.0	27.5	30.0	19.0	31.0
Range of temperature	40.0	50.0	39.0	32.0	33.8	49.7	50.0	43.0	45.2	37.0	56.0	45.0
Average humidity	77.1	68.3	77.2	84.0	76.4	77.9	83.0	77.7	87.1	77.6	76.6	79.9
Average dew point					38.1	38.2	40.6	42.6	43.3	40.2	39.8	41.0
Prevailing wind	S.E.	N.	S.E.	S.E.	N.	S.E.	S.E.	N.W.	N.W.	S.E.	S.E.	S.E.
Total precipitation	18.74	7.53	6.88	23.01	7.56	4.47	8.33	13.10	14.00	9.61	7.47	5.11
Total velocity of wind	13,452	12,650	13,735	16,092	14,611	11,131	12,294	16,406	13,889	14,003	13,944	10,519
Maximum velocity of wind	36	33	39	40	32	36	33	36	44	33	40	36
Direction of maximum velocity	S.E.	N.	S.	S.E.	N.	N.W.	S.	N.W.	S.E.	N.W.	S.E.	N.W. & S.E.
Clear days	26	44	39	14	46	52	47	40	42	41	44	36
Fair days	28	31	17	26	26	30	25	28	29	29	32	29
Cloudy days	36	15	35	50	18	8	19	23	19	20	15	25
Foggy days	0	0	6	6	5	4	8	0	7	0	0	0
Days rain fell	39	23	29	46	30	16	26	28	26	28	33	25
Snow storms	0	1	1	0	2	3	0	0	0	0	3	0
Solar halos	0	0	1	1	3	0	3	0	0	1	1	1
Lunar halos	0	0	3	2	1	0	2	0	1	0	0	1
Number of light frosts	9	15	11	11	27	19	5	25	8	10	5	18
Number of killing frosts	12	26	17	0	11	28	25	5	6	15	24	12
Number of days temperature below 32°	5	17	17	0	5	23	11	4	4	4	15	7

Comparative Spring Weather in Sacramento, from 1878 to 1888.—The following table shows the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; average relative humidity and dew point; total precipitation; prevailing direction, total and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and days that rain fell; solar and lunar halos; light and killing frosts; number of days the maximum temperature was above 90°, and the minimum below 32°:

Spring of:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.94	30.05	30.06	30.01	30.04	30.01	29.97	29.97	30.00	29.96	29.98
Highest barometer	30.39	30.33	30.36	30.41	30.38	30.43	30.30	30.37	30.35	30.27	30.48
Lowest barometer	29.56	29.73	29.55	29.68	29.71	29.62	29.51	29.52	29.63	29.65	29.64
Range of barometer	0.83	0.60	0.81	0.73	0.67	0.81	0.79	0.85	0.72	0.62	0.84
Average temperature	60.5	59.3	55.0	60.4	57.6	58.5	57.9	61.8	56.5	59.7	59.2
Highest temperature	91.0	91.0	86.0	88.8	94.6	98.0	85.0	98.0	94.0	98.0	90.0
Lowest temperature	40.0	38.0	29.0	37.0	34.1	39.8	39.0	39.0	37.7	39.0	37.0
Range of temperature	51.0	53.0	57.0	51.8	60.5	58.2	46.0	59.0	56.3	59.0	53.0
Average humidity	67.1	68.4	66.2	68.4	61.9	68.9	73.3	64.9	71.9	65.3	66.9
Average dew point					43.0	47.3	48.8	48.8	46.7	46.8	47.0
Prevailing wind	S.	S.E.	S.E.	S.	N.	S.	S.W.	S.W.	S.W.	N.W.	S.W.
Total precipitation	4.33	8.84	16.66	3.01	6.12	7.22	12.52	0.76	6.83	3.52	3.54
Total velocity of wind	13,962	14,530	19.653	14,966	17,774	15,825	18,168	16,670	17,759	17,211	16,810
Maximum velocity of wind	40	32	36	28	35	34	35	30	37	30	48
Direction of maximum velocity	N.	N.	N.	N.	N.	N.W.	S.	N.W.	N.W.	S.E. & N.W.	S.E.
Clear days	45	39	49	60	57	54	46	58	50	61	59
Fair days	28	34	24	22	19	26	23	28	30	25	23
Cloudy days	19	19	19	10	16	12	23	6	12	6	10
Days rain fell	21	32	27	16	25	24	27	11	26	17	19
Solar halos	1	1	3	0	1	5	5	0	6	5	2
Lunar halos	0	0	1	0	2	0	3	0	2	0	2
Number of light frosts	2	2	3	5	6	2	10	4	4	3	0
Number of killing frosts	0	0	3	0	0	0	0	0	0	0	0
Number of days temperature above 90°	1	1	0	0	2	2	0	4	1	3	0
Number of days temperature below 32°	0	0	1	0	0	0	0	0	0	0	0

Comparative Summer Weather in Sacramento, from 1878 to 1888.—The tabulated meteorological data below show the average, highest, lowest, and range of barometer; average, highest, lowest, and range of temperature; prevailing direction, total and maximum velocity of wind, with the direction at the time of maximum velocity; total number of clear, fair, and cloudy days, and number of days upon which rain fell; solar and lunar halos; light and killing frosts; total number of days maximum temperature was above 90°:

Summer of:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.82	29.82	29.88	29.90	29.90	29.91	29.92	29.87	29.85	29.78	29.88
Highest barometer	30.12	30.08	30.19	30.14	30.10	30.20	30.14	30.12	30.06	30.06	30.21
Lowest barometer	29.63	29.62	29.58	29.70	29.72	29.63	29.73	29.64	29.65	29.50	29.63
Range of barometer	0.49	0.46	0.61	0.44	0.38	0.57	0.41	0.48	0.41	0.56	0.58
Average temperature	72.9	72.9	69.1	68.5	71.1	72.4	69.8	70.1	70.9	69.5	71.6
Highest temperature	100.5	103.0	98.0	98.6	99.8	103.5	100.0	105.0	105.0	100.0	107.5
Lowest temperature	49.0	51.0	49.0	48.0	51.2	49.8	52.9	51.5	51.5	47.0	48.5
Range of temperature	51.5	52.0	49.0	50.6	48.6	53.7	47.1	43.5	53.5	53.0	59.0
Average humidity	54.7	52.7	59.3	56.3	57.0	58.4	63.3	55.8	59.5	59.7	57.2
Average dew point					53.8	55.7	56.0	52.2	54.8	53.3	53.0
Prevailing wind	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.	S.
Total precipitation	.00	0.13	sprin.	0.50	0.10	.00	1.45	0.11	.00	sprin.	0.08
Total velocity of wind	13,303	13,645	16,066	16,531	15,449	15,609	16,518	18,474	14,917	16,465	15,625
Maximum velocity of wind	20	26	22	22	28	31	24	25	42	30	36
Direction of maximum velocity	N.W.	N.	S.	S.W.	N.W.	N.W.	S.W.	S.	N.W.	S.W.	S.W.
Clear days	83	81	85	86	87	89	77	81	91	86	77
Fair days	9	11	7	5	4	3	9	10	1	6	11
Cloudy days	0	0	0	1	1	0	6	1	0	0	4
Days rain fell	0	3	2	3	2	0	8	3	0	1	10
Solar halos	0	0	0	0	1	3	0	2	0	0	8
Lunar halos	0	0	0	0	0	0	0	0	0	0	0
Number of days temperature above 90°	30	38	12	16	32	34	21	30	35	31	40

Comparative Fall or Autumn Weather in Sacramento, from 1877 to 1888.—The following comparative weather table shows the average barometer; highest, lowest, and range of barometer; average temperature; highest, lowest, and range of temperature; average relative humidity and dew point; total rainfall; prevailing direction, total and maximum velocity of wind, with the direction at time of maximum velocity; total number of clear, fair, and cloudy days, and number of days rain fell; solar and lunar halos; light and killing frosts; number of days maximum temperature was above 90°; number of days minimum temperature was below 32°:

Fall of:	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.97	29.99	30.00	30.04	30.03	30.02	30.01	30.00	29.93	30.01	29.91	29.96
Highest barometer	30.34	30.47	30.41	30.49	30.44	30.45	30.41	30.27	30.27	30.27	30.26	30.20
Lowest barometer	29.70	29.68	29.38	29.73	29.61	29.77	29.62	29.62	29.46	29.58	29.60	29.58
Range of barometer	0.64	0.79	1.03	0.76	0.83	0.68	0.79	0.65	0.81	0.79	0.66	0.62
Average temperature	63.4	62.5	60.9	59.9	58.5	58.8	60.1	60.0	62.8	58.5	63.9	63.8
Highest temperature	88.0	92.0	96.0	92.0	96.0	99.6	101.0	93.5	98.5	96.0	100.0	106.0
Lowest temperature	37.0	34.0	33.0	27.0	32.0	34.0	29.0	37.7	38.5	32.2	28.0	32.2
Range of temperature	51.0	58.0	63.0	65.0	64.0	65.6	72.0	55.8	60.0	63.8	72.0	73.8
Average humidity	54.3	54.4	65.2	54.9	58.4	69.6	68.8	69.1	66.3	64.5	54.0	63.1
Average dew point					42.4	47.5	48.7	49.0	49.2	45.1	44.9	48.6
Prevailing wind	S.	N.	S.	N.	N.	N.W.	S.	N.&S.E.	S.E.	N.W.	N.W.	S.E.
Total precipitation	1.80	1.35	2.93	0.05	2.73	6.42	2.48	2.61	11.44	0.89	0.47	4.83
Total velocity of wind	10,669	11,269	10,492	11,518	12,993	12,213	10,771	10,659	14,214	10,635	11,866	12,203
Maximum velocity of wind	28	32	36	28	24	32	25	27	36	36	33	36
Direction of maximum velocity	N.W.	N.	N.	N.	N.	N.W.	N.W.	N.W.	S.E.	N.W.	N.W.	N.
Clear days	76	71	59	71	73	61	67	75	51	78	74	69
Fair days	6	16	20	14	15	22	18	13	23	12	13	13
Cloudy days	9	4	12	6	3	8	6	3	17	1	3	9
Days rain fell	13	7	13	2	12	16	14	9	25	7	7	12
Solar halos	0	0	2	2	0	1	0	1	2	1	2	1
Lunar halos	1	0	2	0	0	0	0	4	0	0	0	0
Number of light frosts	3	6	5	4	11	26	19	17	3	20	5	5
Number of killing frosts	0	3	4	12	3	0	6	0	0	2	3	0
Number of days temperature above 90°	12	4	10	4	5	8	8	1	15	9	14	18
Number of days temperature below 32°	0	0	0	9	0	0	2	0	0	0	2	0

Annual Weather Summary in Sacramento, from 1878 to 1888.—The accompanying table gives the average barometer, the highest, lowest, and range of barometer for each year; average temperature; highest, lowest, and range of temperature; greatest and least monthly range of temperature; average maximum, minimum, and range of temperature; average relative humidity and dew point; yearly precipitation; prevailing direction of wind; maximum velocity of wind, and direction at time of maximum velocity; number of clear, fair, cloudy, and foggy days, and number of days each year that rain fell; number of earthquakes, snow storms, and electric storms; number of solar and lunar halos, light and killing frosts; number of days the maximum temperature was above 90°, and total number of days the minimum temperature was below 32°:

Annual Weather Review for:	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	29.95	30.00	30.03	30.03	30.03	30.03	29.99	29.98	29.99	29.98	29.97
Highest barometer	30.51	30.68	30.49	30.46	30.52	30.74	30.58	30.43	30.51	30.46	30.62
Lowest barometer	29.46	29.38	29.48	29.61	29.71	29.62	29.42	29.46	29.32	29.45	29.49
Range of barometer	1.05	1.30	1.01	0.85	0.81	1.12	1.16	0.97	1.19	1.01	1.13
Average temperature	61.3	60.3	57.2	59.2	58.5	58.8	58.8	61.2	58.8	59.9	60.6
Highest temperature	100.5	103.0	98.0	98.6	99.8	103.5	100.0	105.0	105.0	100.0	107.5
Lowest temperature	23.5	25.0	25.0	31.9	27.0	22.0	21.0	34.2	27.5	28.0	19.0
Range of temperature	77.0	78.0	73.0	66.7	72.8	81.5	79.0	70.8	77.5	72.0	88.5
Greatest range of temperature	50.0	49.0	49.0	46.7	55.2	55.8	46.0	58.0	52.8	58.7	56.5
Least range of temperature	21.0	33.7	25.0	27.0	31.6	35.7	30.0	27.0	33.2	35.2	27.0
Average maximum temperature	81.5	83.7	80.0	81.6	82.0	84.3	70.0	73.2	71.5	72.9	73.3
Average minimum temperature	41.2	41.2	39.9	42.1	40.1	39.8	49.7	51.8	49.1	47.7	49.4
Mean maximum and minimum temperature	61.4	62.4	59.9	61.8	61.0	62.0	59.8	62.5	60.3	60.3	61.4
Average range of temperature	40.3	42.5	40.1	39.5	41.9	44.5	38.8	40.7	42.6	46.2	45.8
Average humidity	62.2	65.7	64.6	66.7	66.0	69.0	70.7	67.8	70.1	63.7	67.1
Average dew point					45.7	47.3	48.5	48.8	47.8	46.0	47.6
Prevailing direction of wind	S.	S.	S.	S.	S.	S.	S.	S.	S.E.	N.W.	S.E.
Total precipitation	23.45	22.37	31.99	20.71	18.06	13.48	34.92	20.72	18.17	13.43	18.46
Total velocity of wind	52,830	52,214	62,497	57,846	58,874	52,637	62,611	62,405	56,036	61,322	56,964
Maximum velocity of wind	40	39	40	32	35	36	36	36	44	40	48
Direction of maximum velocity	N.	S.	S.E.	S.E.	S.E.	N.W.	N.W.	S.E.	S.E.	S.E.	S.E.
Total clear days	234	208	237	251	249	263	239	227	262	267	238
Total fair days	75	99	59	69	76	76	68	88	76	74	75
Total cloudy days	56	58	70	45	40	26	59	50	27	24	52
Total foggy days	0	4	5	8	1	11	0	0	4	0	0
Total days of precipitation	66	79	70	67	70	54	76	62	57	56	63
Number of earthquakes	2	0	0	1	0	0	0	2	1	1	2
Snow storms	0	1	1	0	3	2	0	0	0	0	3
Electric storms	4	4	3	4	4	2	2	6	3	2	3
Number of solar halos	1	3	6	2	5	8	9	4	8	8	13
Number of lunar halos	0	2	4	2	3	0	9	1	2	0	1
Number of light frosts	18	17	14	34	69	33	31	24	30	18	6
Number of killing frosts	22	27	32	4	12	40	22	0	10	26	14
Number of days temperature was above 90°	35	48	16	18	43	45	22	49	45	48	58
Number of days temperature was below 32°	15	14	17	1	5	27	13	0	4	9	12

Rainfall of Sacramento from September, 1849, to September, 1888.—The following table of rainfall, from September, 1849, to September 1, 1888, was collected from the records of Dr. T. M. Logan, Dr. F. W. Hatch, and those of the United States Signal Service:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1849									.25	1.50	2.25	12.50		1849-50	36.00
1850	4.50	.50	10.00	4.25	.25	none	none	none	none	none	sprin.	sprin.	19.50	1850-51	4.71
1851	.65	.35	1.88	1.14	.69	none	none	none	1.00	.18	2.14	7.07	15.10	1851-52	17.98
1852	.58	.12	6.40	.19	.30	none	none	none	sprin.	none	6.00	13.40	27.00	1852-53	36.36
1853	3.00	2.00	7.00	3.50	1.45	sprin.	sprin.	none	sprin.	sprin.	1.50	1.54	19.99	1853-54	20.06
1854	3.25	8.50	3.25	1.50	.21	.31	none	sprin.	sprin.	1.01	.65	1.15	19.83	1854-55	18.62
1855	2.67	3.46	4.20	4.32	1.15	.01	none	none	sprin.	none	.75	2.00	18.56	1855-56	13.76
1856	4.92	.69	1.40	2.13	1.84	.03	none	none	sprin.	.20	.65	2.40	14.26	1856-57	10.46
1857	1.38	4.80	.68	sprin.	sprin.	.35	none	sprin.	none	.66	2.41	2.63	12.91	1857-58	15.00
1858	2.44	2.46	2.88	1.21	.20	.10	.01	sprin.	sprin.	3.01	.15	4.34	16.80	1858-59	16.03
1859	.96	3.91	1.64	.98	1.04	none	none	none	.02	none	6.48	1.83	16.86	1859-60	22.09
1860	2.31	.93	5.11	2.87	2.49	.02	.63	none	.06	.91	.18	4.28	19.19	1860-61	16.10
1861	2.67	2.92	3.32	.48	.59	.14	.55	none	none	sprin.	2.17	8.64	21.38	1861-62	35.56
1862	15.04	4 26	2.80	.82	1.81	.01	none	.01	none	.36	sprin.	2.33	27.44	1862-63	11.58
1863	1.73	2.75	2.36	1.69	.36	none	none	none	sprin.	none	1.49	1.82	12.20	1863-64	7.87
1864	1.08	.19	1.30	1.08	.74	.09	none	.08	sprin.	.12	6.72	7.87	19.27	1864-65	22.51
1865	4.78	.71	.48	1.37	.46	none	sprin.	none	.08	.48	2.43	.36	11.15	1865-66	17.93
1866	7.70	2.01	2.02	.48	2.25	.10	.02	none	none	sprin.	2.43	9.51	26.52	1866-67	25.30
1867	3.44	7.10	1.01	1.80	.01	none	none	none	.01	none	3.81	12.85	30.03	1867-68	32.79
1868	6.04	3.15	4.35	2.31	.27	sprin.	none	none	none	none	.77	2.61	19.50	1868-69	16.64
1869	4.79	3.63	2.94	1.24	.65	.01	none	none	sprin.	2.12	.85	1.96	18.19	1869-70	13.57
1870	1.37	3.24	1.64	2.12	.27	sprin.	sprin.	sprin.	none	.02	.58	.97	10.21	1870-71	8.47
1871	2.08	1.92	.69	1.45	.76	sprin.	none	none	sprin.	.21	1.22	10.59	18.92	1871-72	23.65
1872	4.04	4.74	1.94	.61	.28	.02	none	none	sprin.	.22	1.93	5.39	19.17	1872-73	14.21
1873	1.23	4.36	.55	.51	none	sprin.	.02	sprin.	none	.31	1.21	10.01	18.20	1873-74	22.90
1874	5.20	1.86	3.05	.89	.37	sprin.	sprin.	none	.05	2.26	3.80	.44	17.92	1874-75	17.70
1875	8.70	.55	.80	sprin.	sprin.	1.10	none	none	none	.44	6.20	5.52	23.31	1875-76	26.53
1876	4.99	3.75	4.15	1.10	.15	none	.21	.02	sprin.	3.45	.30	none	18.12	1876-77	8.96
1877	2.77	1.04	.56	.19	.64	.01	sprin.	sprin.	none	.73	1.07	1.43	8.44	1877-78	24.86
1878	9.26	8.04	3.09	1.07	.17	none	none	none	.29	.55	.51	.47	23.45	1878-79	17.85
1879	3.18	3.88	4.88	2.66	1.30	.13	sprin.	sprin.	none	.88	2.05	3.41	22.37	1879-80	26.47
1880	1.64	1.83	1.70	14.20	.76	none	sprin.	none	none	none	.05	11.81	31.99	1880-81	26.57
1881	6.14	5.06	1.37	1.64	sprin.	.50	sprin.	none	.30	.55	1.88	3.27	20.71	1881-82	16.51
1882	1 89	2.40	3.78	1.99	.35	.10	sprin.	none	.57	2.63	3.22	1.13	18.06	1882-83	18.11
1883	2.23	1.11	3.70	.67	2.85	none	none	none	.90	.96	.61	.44	13.48	1883-84	24.78
1884	3.43	4.46	8.14	4.32	.06	1.45	none	sprin.	.60	2.01	none	10.45	34.92	1884-85	16.58
1885	2.16	.49	.08	.68	sprin.	.11	sprin.	none	.08	.02	11.34	5.76	20.72	1885-86	32.27
1886	7.95	.29	2.68	4.08	.07	none	none	none	none	.68	.21	2.21	18.17	1886-87	13.97

1887	1.12	6.28	.94	2.53	sprin.	none	none	sprin.	.02	none	.45	2.09	13.43	1887–88	11.56
1888	4.81	.57	3.04	.10	.40	.08	sprin.	sprin.	.55	none	4.28	4.63	18.46	1888–89	*19.65
1889*	.15	.33	6.25	.26	3.20										
Totals	148.27	110.64	118.05	74.17	26.19	4.67	1.14	.11	4.78	26.48	84.74	181.12	757.13		763.87
Averages	3.707	2.766	2.951	1.902	0.672	0.120	0.029	0.003	0.120	0.662	2.118	4.528	19.414		19.586

* Up to May 7, 1889.

Heavy Rainfalls at Sacramento.

The following data from the Signal Service records show the greatest precipitation in any consecutive twenty-four hours for each year from 1877 to date:

Year.	Month and Date.	Total Amount.
1877	November eleventh	0.81 inches.
1878	January fifteenth	1.63 inches.
1879	March fifth	1.97 inches.
1880	April twenty-first	7.24 inches.
1881	January twenty-ninth	2.66 inches.
1882	October third	1.82 inches.
1883	January first	1.90 inches.
1884	March eighth and ninth	2.94 inches.
1885	November seventeenth and eighteenth	4.29 inches.
1886	January twenty-third	2.50 inches.
1887	February fourth and fifth	2.48 inches.
1888	January second and third	1.90 inches.
1889	March twelfth and thirteenth	2.57 inches.
1889*	May fourth and fifth	2.42 inches.

*Up to May 7, 1889.

Monthly Weather Summary at Sacramento for 1888.

January—The average monthly mean temperature was 42.8°. The normal for thirty-four years is 47°, showing this month to have been 4.8° colder than the average for many years; in fact, a monthly mean temperature of 42.8° for January has never occurred here before; the lowest mean temperature was 43°, in 1854, which was the coldest month of that name, with the exception of this one, ever known since records were kept. The lowest temperature in January, 1854, was 19°, at 8 A. M., by Dr. Logan, although other thermometers indicated 17°. This month the lowest was 19° by the Signal Office records; 18° by Captain Foster, corner Eleventh and F Streets, and 16° by S. H. Gerrish, 1517 G Street. There was snow on the 4th, 5th, and 16th—1½ inches on the 4th, 2½ inches on the 5th, and a trace on the 16th. Mr. Gerrish reports snow fell in previous Januarys as follows: 1862, .75 of an inch; 1868, 1.62 inches; 1880, about one quarter of an inch. Highest and lowest temperature this month, 63° and 19°. Total precipitation, 4.81 inches.

February—Average temperature, 52.6°, being 1.8° warmer than the normal; the highest and lowest was 75° and 54°. Total rainfall, .57 of an inch, being 2.32 inches less than the average for many years. This month was extraordinarily warm and mild. Clear days, 21; fair, 7; cloudy, 1; and days rain fell, 15.

March—Average temperature, 54°, being 1° cooler than the usual March average. Highest and lowest temperature, 76° and 37°. Total precipitation, 3.04 inches, being .23 of an inch in excess of the average. Severe gales of wind during the month, reaching an extreme velocity of sixty miles per hour, and uprooting several trees in Capitol Park. Clear days, 17; fair, 8; cloudy, 9; and days rain fell, 9.

April—The mean temperature for this month was 62°, being 3° warmer than the normal or average temperature as deduced from a record of many years. The highest and lowest temperature was 89° and 43°. The rainfall was .10 of an inch, being 1.85 inches less than the normal or average precipitation. The two driest Aprils on record are those of 1857 and 1875,

when but a sprinkle of a few drops occurred. Clear days, 23; fair, 5; cloudy and days rain fell, 2.

May—Mean temperature, 62°, being 2° warmer than the normal or average temperature. The coldest May was in 1860, 58°, and the warmest was that of 1865, 70°. The highest and lowest temperature this month was 90° and 46°. The rainfall was .40 of inch, being .28 of an inch less than the normal precipitation. The wettest May that of 1883, 2.85 inches. The coolness of this month helped the grain and other crops materially, and the absence of severe north wind was favorable to growing crops. Clear days, 19; fair, 10; cloudy, 2; and 4 upon which rain fell.

June—Mean temperature, 68°, being 2° cooler than the normal or average of many years. The highest and lowest temperature was 96° and 48°. The rainfall was .08 of an inch, being .04 of an inch less than the average precipitation. Clear days, 17; fair, 9; cloudy, 4; and 7 upon which rain was precipitated. This month was unusually cool, there being but two days on which a temperature above 90° was recorded, while the average is five. There were more solar halos, parhelia, and other atmospheric phenomena than were ever before recorded in ten years past, and less dry days than were ever recorded in the same number of years. Days of maximum temperature above 90°, 2.

July—Mean temperature, 72°, being 1° cooler than the average for many years. The highest and lowest temperature was 104° and 51°. Rainfall, a sprinkle, being .03 of an inch less than the normal precipitation. Clear days, 29; fair, 2; cloudy, none; and days that rain fell, 2; days highest temperature above 90°, 15.

August—Mean temperature, 75°, being 3° warmer than the average or normal, as deduced from a record of many years. Highest and lowest temperature, 108° and 51°. Rainfall, inappreciable in amount, being about the same as is usually precipitated during this month. Clear days, 30; fair, 1; cloudy, none; and days that rain fell, 1. Number of days temperature above 90°, 23, being the greatest number of clear days ever recorded in 11 years past. The greatest before this was 18, in 1885, and the least, 5, in 1887.

September—The hottest September ever recorded in 11 years past. Mean temperature, 74°, being 5° warmer than the average of 35 years. The highest, 106°, and lowest, 50°. Rainfall, .55 of an inch, being .44 of an inch more than the average or normal precipitation, as deduced from a record of many years. Clear days, 24; fair, 3; cloudy, 3; and 2 upon which rain was precipitated. Number of days with a temperature above 90°, 17; eight of these reaching 100° and over. There were four separate and distinct thunder storms in a little over one day, something unknown to the oldest inhabitant.

October—Mean temperature, 64°, being 2° warmer than the average for many years. Highest and lowest temperature, 92° and 40°. There was no rainfall this month, while the average precipitation of 35 years' observations is .69 of an inch. Clear days, 28; fair, 3; days temperature above 90°, 1.

November—Mean temperature, 54°, being 1° warmer than the average. Highest and lowest temperature, 75° and 32°. Rainfall, 4.28 inches, being 2.22 inches above the average precipitation. Clear days, 17; fair, 7; cloudy, 6; and days rain fell, 9.

December—Mean temperature, 48°, being 1° warmer than the average of many years. Rainfall, 4.63 inches, being .11 of an inch above the average or normal precipitation, as deduced from a record of 35 years. Clear days,

5; fair, 8; cloudy, 18; and days that rain fell, 14. Highest and lowest temperature, 63° and 36°.

The mean temperature for the year 1888 is 60.6°, or about 0.4° higher than the average of many years. The above data show that the mean monthly temperature was below the average for January, March, June, July, and above the average in February, April, May, August, September, October, November, and December. Highest and lowest temperature during the year was 108° and 19°.

Summary for January, February, and March, 1889.

January—Mean temperature, 45°, being 2° cooler than the average of many years. Highest and lowest temperature, 62° and 44°. Rainfall, .15 of an inch, being 3.56 inches less than the average of 40 years. In fact, it was the driest January ever known in that length of time. Clear days, 18; fair, 9; and cloudy, 4.

February—Mean temperature, 50.3°, being one half (0.5) of a degree cooler than the average of many years. The highest and lowest temperature was 76° and 31°. Rainfall, .33 of an inch, being 2.44 inches behind the average of 40 years. Clear days, 13; fair, 12; and cloudy, 3.

March—Mean temperature, 57°, being 2° warmer than the average of 35 years past. The highest and lowest temperature was 76° and 41°. Rainfall, 6.25 inches, being 3.30 inches in excess of the average of 40 years. There were two thunder and lightning storms, one quite severe, giving twelve bright flashes of forked lightning, and peals of thunder. One light frost, on the 19th. There were 6 clear days, 12 fair, and 13 cloudy ones.

Average Monthly Temperature from 1854 to 1889, for Sacramento.—From the records of Dr. Logan, S. H. Gerrish, and the U. S. Signal Office:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	Sept.	October.	Nov.	Dec.
1854	43.0	51.0	53.0	60.0	62.0	67.0	80.6	69.5	65.0	60.0	55.0	47.9
1855	43.7	52.5	54.8	58.1	60.2	71.1	72.5	73.0	68.0	63.0	50.6	46.0
1856	48.0	52.6	57.0	58.8	63.9	71.1	75.1	69.6	70.9	58.0	52.2	43.9
1857	48.5	50.2	56.4	63.3	65.5	71.9	71.4	71.3	67.9	61.5	53.2	47.4
1858	45.0	52.2	53.7	59.8	65.2	69.4	70.8	70.6	68.9	59.5	54.2	44.5
1859	44.9	50.5	51.5	57.1	63.0	74.8	69.1	67.2	65.9	63.3	54.0	43.5
1860	46.2	49.8	53.3	57.8	58.5	65.6	73.2	73.5	67.6	59.8	53.5	49.3
1861	47.1	52.2	55.0	60.6	63.7	66.2	73.6	69.7	67.8	59.9	53.6	50.9
1862	46.4	47.5	53.6	58.0	61.2	69.3	73.2	75.0	70.4	67.6	53.1	46.4
1863	46.9	48.0	57.6	59.5	67.1	69.1	75.6	70.7	69.0	62.8	52.7	46.5
1864	49.2	53.6	56.1	62.1	68.5	71.1	74.8	74.7	69.8	64.5	53.5	50.2
1865	47.4	49.0	53.6	59.3	70.2	73.5	74.0	71.7	68.8	63.1	56.9	44.1
1866	46.5	63.5	54.2	61.9	63.1	72.2	76.2	76.0	72.2	65.2	53.8	50.2
1867	48.2	47.8	50.7	59.7	64.4	70.3	73.7	71.7	68.8	62.7	54.8	46.8
1868	47.0	50.5	55.0	60.1	64.2	69.5	73.8	71.2	68.3	62.0	53.9	47.0
1869	47.6	49.9	53.6	59.0	64.2	70.8	74.3	71.3	69.9	63.1	54.0	46.5
1870	48.6	51.1	53.0	57.0	61.0	69.3	71.8	72.6	68.0	63.6	53.4	45.5
1871	48.3	47.4	56.0	59.2	61.5	70.1	70.2	72.0	67.4	62.2	50.2	48.7
1872	48.5	53.3	56.8	57.6	67.0	69.2	71.4	73.1	68.8	58.9	51.2	49.0
1873	52.7	48.2	56.8	60.0	67.9	71.7	73.2	66.3	69.9	61.4	57.5	47.7
1874	45.7	49.3	52.9	59.5	64.7	70.2	72.8	70.9	70.7	61.7	53.9	45.0
1875	46.9	52.7	58.7	63.0	68.1	70.6	73.3	72.5	65.7	69.9	56.7	48.0
1876	48.8	50.2	54.6	59.5	65.7	76.9	74.0	72.8	70.1	63.5	53.3	45.5
1877	49.1	55.0	59.0	60.2	64.5	72.5	75.0	72.9	72.8	62.9	54.7	48.6
1878	49.7	51.3	56.7	59.4	65.5	71.8	73.4	73.4	69.0	62.9	55.5	47.2
1879	45.5	55.0	57.4	60.3	60.2	72.1	71.8	74.7	70.5	61.5	50.9	44.0
1880	43.5	46.0	48.8	54.6	61.6	66.6	70.9	69.7	68.0	62.1	49.7	50.3
1881	49.2	53.5	55.5	60.9	64.8	66.2	71.1	68.2	67.8	56.8	50.8	46.2
1882	45.1	46.3	53.0	55.8	64.0	68.1	73.4	71.9	68.4	58.4	49.5	48.2
1883	41.9	46.0	56.9	56.0	62.6	72.6	73.1	71.4	71.6	58.2	50.5	44.2
1884	46.6	46.9	52.9	56.7	64.0	65.8	71.2	72.5	64.8	59.9	55.3	48.8
1885	47.1	54.0	59.1	60.6	65.7	66.2	71.0	73.0	69.8	64.3	54.4	49.1
1886	45.7	53.3	52.1	55.5	62.0	69.0	72.0	71.6	67.9	57.1	50.4	49.2
1887	48.5	44.7	57.8	58.3	62.9	69.1	70.2	69.1	70.4	66.5	54.7	46.9
1888	42.8	52.6	53.6	62.3	61.8	67.7	71.6	75.4	73.7	64.2	53.6	48.4
1889	44.6	50.3	57.0	60.4	------	------	------	------	------	------	------	------
Totals	1684.4	1829.9	1977.7	2131.9	2240.4	2448.6	2553.3	2510.7	2414.5	2172.0	1865.2	1651.6
Average for 35 years	*46.8	*50.8	*54.9	*59.2	64.0	70.0	72.0	71.7	69.0	62.1	53.3	47.2

* Average for 36 years.

Average Annual and Seasonal Temperature in Sacramento.

The statement below shows the average temperature, for each year, for thirty-six years; also the spring, summer, autumn, and winter temperature for the same time. The coldest year, inferring from the average temperature, was that of 1880, 57.2°; the warmest was 1864, 62.8°; the mean average for the past thirty-six years, 60.2°, showing the coldest to have been 3° below the mean average, while the warmest year was that of 1864, when it was 2.6° above the mean average of thirty-six years. By careful study of the table, there will be noticed but a slight difference between the coldest and the warmest year, as compared with an average of thirty-six years; generally not more than 3°. Therefore, we might safely say that the average temperature of any year is not likely to vary more than 3° from 60° either way, between the hottest and coldest year, as compared with the mean average temperature of many years:

Year.	Mean Annual Temperature.	Mean Spring Temperature.	Mean Summer Temperature.	Mean Autumn Temperature.	Mean Winter Temperature.	
1853	62.6	62.9	74.3	69.0	1853-54	43.7
1854	59.5	58.3	72.4	60.0	1854-55	48.0
1855	59.5	57.7	72.2	60.5	1855-56	48.9
1856	60.1	59.9	71.9	60.4	1856-57	47.5
1857	60.7	61.7	71.5	60.9	1857-58	48.2
1858	59.5	59.6	70.3	60.9	1858-59	46.6
1859	58.7	57.2	70.4	61.1	1859-60	46.5
1860	59.0	56.5	70.8	60.3	1860-61	49.5
1861	60.1	59.8	69.8	60.4	1861-62	48.3
1862	62.2	57.6	72.5	63.7	1862-63	47.1
1863	60.3	61.4	71.8	61.5	1863-64	49.8
1864	62.8	62.2	73.5	62.6	1864-65	48.9
1865	61.0	61.0	73.1	62.9	1865-66	51.4
1866	62.1	59.7	74.8	63.7	1866-67	48.7
1867	59.9	58.3	71.9	62.1	1867-68	48.1
1868	60.1	59.8	71.5	61.4	1868-69	48.2
1869	60.4	58.9	72.1	62.3	1869-70	48.7
1870	59.6	57.0	71.2	61.7	1870-71	47.7
1871	59.6	58.9	70.8	59.9	1871-72	50.2
1872	60.4	60.5	71.6	59.6	1872-73	50.0
1873	60.7	61.6	70.4	62.9	1873-74	47.6
1874	59.8	59.0	71.3	62.1	1874-75	48.2
1875	62.5	63.3	72.1	64.1	1875-76	49.0
1876	61.7	59.9	74.6	62.3	1876-77	49.9
1877	61.2	61.2	73.5	63.4	1877-78	49.9
1878	61.3	60.5	72.9	62.5	1878-79	49.2
1879	60.3	59.3	72.9	60.9	1879-80	44.5
1880	57.2	55.0	69.1	59.9	1880-81	51.0
1881	59.2	60.4	68.5	58.5	1881-82	45.9
1882	58.5	57.6	71.1	58.8	1882-83	45.4
1883	58.8	58.5	72.4	60.1	1883-84	45.9
1884	58.8	57.9	69.8	60.0	1884-85	50.0
1885	61.2	61.8	70.1	62.8	1885-86	49.4
1886	58.8	56.5	70.9	58.5	1886-87	47.5
1887	59.9	59.7	69.5	63.9	1887-88	47.4
1888	60.6	59.2	71.6	63.8	1888-89	47.8
Totals	2166.6	2140.3	2578.6	2219.6		1738.2
Averages for 36 years	60.2	59.5	71.6	61.6		48.3

Rainfall for Spring, Summer, Autumn, Winter, and Total for Each Year, at Sacramento.

The following table gives the rainfall for each season of spring, summer, autumn, and winter; also the total rainfall for each year and for each season. The table shows the annual rainfall for each year, beginning with the year 1850, and the total for each season, beginning with that of 1849–50. The rainfall for the winter seasons begins with the winter of 1849–50, and ends with the winter of 1888–89, making a total of forty winters:

Year.	Rainfall for Spring.	Rainfall for Summer.	Rainfall for Autumn.	Rainfall for Winter.	Annual Rainfall.	Season of.	Inches.
1849	.....	.....	4.00	.....	*16.50	1849–50	36.00
1850	14.50	none	sprin.	17.80	19.50	1850–51	4.71
1851	3.71	none	3.32	1.00	15.10	1851–52	17.98
1852	6.89	none	6.00	7.77	27.00	1852–53	36.36
1853	11.95	sprin.	1.50	18.41	19.99	1853–54	20.06
1854	4.96	.31	1.66	13.29	19.83	1854–55	18.62
1855	9.67	.01	.75	7.28	18.56	1855–56	13.76
1856	5.37	.03	.85	7.61	14.26	1856–57	10.46
1857	.68	.35	3.06	8.58	12.91	1857–58	15.00
1858	4.29	.11	3.16	7.53	16.80	1858–59	16.03
1859	3.66	none	6.50	9.21	16.86	1859–60	22.09
1860	10.47	.05	1.15	5.07	19.19	1860–61	16.10
1861	4.39	.69	2.17	9.87	21.38	1861–62	35.56
1862	5.43	.02	.36	27.94	27.44	1862–63	11.58
1863	4.41	none	1.49	6.81	12.20	1863–64	7.87
1864	3.12	.17	6.84	3.09	19.27	1864–65	22.51
1865	2.31	sprin.	2.99	13.36	11.15	1865–66	17.93
1866	4.75	.12	2.43	10.07	26.52	1866–67	25.30
1867	2.82	none	3.82	20.05	30.03	1867–68	32.79
1868	6.93	sprin.	.77	22.04	19.50	1868–69	16.64
1869	4.83	.01	2.97	11.03	18.19	1869–70	13.57
1870	4.03	sprin.	.60	6.57	10.21	1870–71	8.47
1871	2.90	sprin.	1.43	4.97	19.32	1871–72	23.65
1872	2.83	.02	2.15	19.47	19.17	1872–73	14.21
1873	1.06	.02	1.52	11.08	18.20	1873–74	22.90
1874	4.31	sprin.	6.11	17.07	17.92	1874–75	17.70
1875	.80	1.10	6.64	9.69	23.31	1875–76	26.53
1876	5.40	.23	3.75	14.26	18.12	1876–77	8.96
1877	1.39	.01	1.80	3.81	8.44	1877–78	24.86
1878	4.33	none	1.35	18.73	23.45	1878–79	17.85
1879	8.84	.13	2.93	7.53	22.37	1879–80	26.47
1880	16.66	sprin.	.05	6.88	31.99	1880–81	26.57
1881	3.01	.50	2.73	23.01	20.71	1881–82	16.51
1882	6.12	.10	6.42	7.56	18.06	1882–83	18.11
1883	7.22	none	2.48	4.47	13.48	1883–84	24.78
1884	12.52	1.45	2.61	8.33	34.92	1884–85	16.58
1885	.76	.11	11.44	13.10	20.72	1885–86	32.27
1886	6.83	none	.89	14.00	18.17	1886–87	13.97
1887	3.52	sprin.	.47	9.61	13.43	1887–88	11.56
1888	3.54	.08	4.83	7.47	18.46	1888–89	†19.65
1889	.....	.....	.....	5.11	.....	.....	.....
Totals	211.21	5.62	115.99	440.23	757.13	.....	763.87
Average	5.414	.144	2.900	11.006	19.414	.....	19.587

*Rainfall for September, October, November, and December, 1849. †Up to May 7, 1889.

Highest, Lowest, and Average Temperature, with Prevailing Wind, at Sacramento.

The following table shows the highest, lowest, and average yearly temperature, along with the prevailing direction of wind, for each year. This data is from the records of Dr. Thomas M. Logan, the Railroad Company, Mr. Samuel H. Gerrish, and the records of the United States Signal Office. The records cover a period of thirty-six years. It shows that a very low temperature is never recorded at this point. Often several years will intervene without the temperature falling to the freezing point. The lowest recorded temperature is 19°, in January, 1854, and January, 1888; the highest, 108°, in August, 1888. The prevailing direction of wind for the year is usually from the south:

Year.	Highest Temperature.	Lowest Temperature.	Average Annual Temperature.	Prevailing Direction of Wind for Each Year.
1853	97	32	62.6	N.W.
1854	102	19	59.5	N.W.
1855	100	25	59.5	N.W.
1856	100	32	60.1	S.E.
1857	98	31	60.7	S.E.
1858	97	29	59.5	S.
1859	96	34	58.7	S.
1860	90	37	59.0	S.
1861	87	36	60.1	S.
1862	94	32	62.2	N.W.
1863	95	34	60.3	N.W.
1864	96	34	62.8	S.E.
1865	94	31	61.0	S.E.
1866	98	33	62.1	S.E.
1867	99	28	59.9	S.
1868	100	30	60.1	S.
1869	102	31	60.4	S.
1870	106	21	59.6	S.
1871	102	30	59.6	S.
1872	100	26	60.4	N.
1873	105	31	60.7	S.
1874	96	33	59.8	S.
1875	100	33	62.5	S.
1876	98	30	61.7	S.
1877	103	31	61.2	S.
1878	101	24	61.3	S.
1879	103	25	60.3	S.
1880	98	25	57.2	S.
1881	99	32	59.2	S.
1882	100	27	58.5	S.
1883	104	22	58.8	S.
1884	100	21	58.8	S.
1885	105	34	61.2	S.
1886	105	28	58.8	S.E.
1887	100	28	59.9	N.W.
1888	108	19	60.6	S.E.

Highest temperature in 36 years, 108°, in August, 1888.
Lowest temperature in 36 years, 19° in January, 1854, and 19° in January, 1888.
Average annual temperature for 36 years, 60.2°.
General prevailing direction of wind, from the south.

Sacramento "River Record," at Sacramento.

The following table shows the highest and lowest water in the river for each season from 1849 to 1861–2, and 1873–4 to April 1, 1888–9. From 1862–3 to 1872–3, both seasons inclusive, the figures are missing. The zero of the gauge was put down in September, 1849, to the lowest water at the lowest point of ebb tide, and from that the high and low water records commence. This zero point of the gauge is 5 feet above the sea level, and 29 feet below the Central Pacific Railroad track, according to a circular issued March 15, 1875, by the Chief Signal Officer at Washington, D. C. This circular says when the river shows 25 feet on the gauge it is then near the danger line, and at that height it is dangerous to levees within 20 miles of Sacramento. The same circular gives the beginning of the danger line for Oroville as 10 feet; at that point it threatens danger to Marysville and all country below Oroville. The danger line at Marysville begins at about 15 feet, and is then dangerous to levees. At Red Bluff 20 feet is the danger line and 22 feet floods the bottoms. The danger line begins at Folsom City at 30 feet:

Highest, Lowest, and Range of Water in the Sacramento River for each Season, from 1849–50 to 1861–2, and from 1873–4 to date.

	Highest Water—feet and tenths.	Lowest Water—feet and tenths.	Range of Water—feet and tenths.
1849–50	20.3	zero of gauge	20.8
1850–51	9.7	zero of gauge	9.7
1851–52	20.0	zero of gauge	20.0
1852–53	21.7	2.2	19.5
1853–54	20.3	0.3	20.0
1854–55	20.3	3.0	17.3
1855–56	12.3	3.3	9.0
1856–57	18.3	zero of gauge	18.3
1857–58	18.7	1.4	17.3
1858–59	19.0	1.3	17.7
1859–60	15.3	1.3	14.0
1860–61	21.7	3.0	18.7
1861–62	24.0	2.4	21.6
1873–74	22.5	4.6	17.9
1874–75	22.2	4.3	17.9
1875–76	24.6	7.1	17.5
1876–77	18.2	5.2	13.0
1877–78	26.0	5.3	20.7
1878–79	23.3	5.5	17.8
1879–80	24.4	5.8	18.7
1880–81	26.6	7.4	19.2
1881–82	21.3	6.4	14.9
1882–83	20.7	6.5	14.2
1883–84	23.5	6.5	17.0
1884–85	24.6	7.5	17.1
1885–86	25.6	7.3	18.3
1886–87	20.5	7.5	13.0
1887–88	20.0	7.2	12.8
1888–89	*25.6	7.0	18.6

* Up to May 1, 1889.

Note.—The record from 1849–50 was taken from Dr. Thomas M. Logan's report. The gauge was put down in September, 1849, at the lowest stage of water. At that time there was from 23 to 24 feet of water in the channel, the water was clear, and the rise and fall of the tide amounted to several feet. The lowest water since 1874 shows 4.3 feet above the lowest water of 1849, the zero point of the gauge. If the river had not been filled with slickens, that would indicate over 20 feet of water in the channel; the real fact shows scarcely five feet, with bars too numerous to mention. The river bed has therefore been raised upwards of 20 feet or more by debris.

Daily Normal Temperature at Sacramento.

The following table of normal temperatures for each day of each month, at Sacramento, California, as deduced from three daily observations for nine years, from July, 1877, to December, 1885, inclusive, were prepared at the Chief Signal Office, Washington, D. C., by authority of the Chief Signal Officer:

Date.	*Jan.	*Feb.	*Mar.	*April.	*May.	*June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	44.2	49.4	55.8	57.7	61.6	69.2	72.3	73.1	73.0	62.3	57.2	50.6
2	45.6	49.5	55.5	58.0	61.7	69.2	71.4	74.0	72.4	62.7	55.6	50.6
3	45.3	49.0	54.0	56.5	62.6	68.8	70.8	73.2	72.5	63.6	*56.5	49.6
4	45.5	49.7	53.4	†57.7	61.2	68.5	71.2	71.9	73.4	64.0	55.5	50.2
5	47.2	48.0	54.8	58.0	61.5	69.4	71.4	72.8	71.8	63.7	56.2	50.6
6	45.9	47.6	54.4	58.3	61.6	68.2	71.5	73.7	69.9	62.7	56.6	49.4
7	46.7	46.0	53.9	58.4	61.4	67.9	70.7	73.9	70.3	62.9	56.9	47.7
8	47.6	47.1	53.7	60.1	62.5	67.2	70.5	74.8	71.5	*62.5	56.2	45.9
9	45.8	47.1	53.7	58.8	61.4	67.5	71.0	75.4	70.8	63.0	55.0	46.1
10	45.9	†48.4	53.0	57.6	62.0	66.1	72.8	74.8	70.9	61.8	53.3	46.1
11	43.9	46.8	53.3	57.3	61.4	†65.7	74.4	74.3	69.9	61.1	52.1	46.4
12	42.7	46.2	53.4	56.6	59.4	68.2	75.4	72.5	70.4	58.7	51.7	45.3
13	43.6	48.1	53.2	56.2	59.9	68.5	74.0	72.0	70.8	57.0	52.0	44.7
14	45.7	47.9	54.1	56.8	59.2	68.3	74.1	72.8	70.4	56.6	53.0	45.7
15	44.6	47.3	54.0	46.5	60.4	67.8	71.5	73.3	70.3	58.6	52.3	47.8
16	45.9	48.8	54.8	55.4	60.4	68.4	73.0	*72.1	68.3	58.9	52.5	47.3
17	46.0	48.9	53.5	54.7	61.5	69.3	72.5	71.5	68.0	60.9	50.5	47.3
18	†45.5	49.7	53.4	56.4	64.0	69.2	70.6	72.9	67.6	61.4	50.1	49.2
19	45.4	50.1	54.0	54.4	65.8	68.6	71.0	71.7	67.5	62.2	50.2	48.6
20	45.7	50.3	55.5	55.4	64.7	68.8	72.5	69.5	68.3	61.3	50.5	47.2
21	45.8	51.2	56.2	57.5	64.0	68.4	73.2	69.2	69.6	61.4	51.0	48.7
22	†47.4	51.9	57.0	58.2	63.8	67.2	73.6	69.5	69.5	60.9	50.7	48.7
23	47.4	53.1	56.5	58.3	64.8	69.2	74.5	69.4	67.3	60.5	50.9	48.0
24	48.0	53.4	56.4	60.1	66.3	68.8	73.3	69.3	66.4	61.0	50.4	49.3
25	47.4	54.9	57.0	58.5	66.9	70.5	71.8	69.7	66.4	61.3	48.5	48.2
26	45.8	54.8	56.4	58.1	67.0	71.5	71.3	69.6	66.7	59.7	48.3	47.2
27	46.3	55.0	†58.4	61.0	67.8	70.5	72.7	69.9	67.1	60.0	48.7	46.7
28	47.1	54.7	56.5	62.7	68.5	68.8	72.3	69.5	66.3	59.7	48.9	46.1
29	48.0	------	57.6	62.7	69.0	69.6	71.7	70.1	65.1	59.6	50.1	44.1
30	48.2	------	57.2	52.6	68.9	71.5	72.5	71.7	63.1	58.1	50.4	43.5
31	49.4	------	57.1	------	69.0	------	72.4	72.7	------	55.9	------	42.6
Monthly	46.1	49.9	55.1	58.0	63.6	68.7	72.3	72.0	69.2	60.8	52.4	47.4

* Means for eight years.
† Means for seven years.

Daily Normal Precipitation at Sacramento.

The following table gives the normal precipitation for each day of each month, at Sacramento, as deduced from thirty-eight years' observations:

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.12	.10	.09	.06	.02	.01	.01	T.	T.	.02	.07	.14
2	.12	.10	.09	.07	.02	T.	T.	T.	T.	.02	.07	.14
3	.12	.11	.09	.06	.02	.01	T.	T.	.01	.02	.07	.14
4	.12	.10	.09	.07	.02	T.	T.	T.	T.	.02	.07	.14
5	.13	.10	.09	.06	.03	.01	T.	T.	T.	.02	.07	.14
6	.12	.11	.09	.07	.02	T.	T.	T.	.01	.02	.07	.14
7	.12	.10	.09	.06	.02	.01	T.	T.	T.	.03	.06	.14
8	.12	.10	.09	.07	.02	T.	T.	T.	.01	.02	.07	.14
9	.12	.11	.09	.06	.02	.01	T.	T.	T.	.02	.07	.14
10	.12	.10	.09	.07	.03	T.	T.	T.	.01	.02	.07	.14
11	.13	.10	.09	.06	.02	.01	T.	T.	T.	.02	.07	.14
12	.12	.11	.09	.07	.02	T.	T.	T.	.01	.02	.07	.14
13	.12	.10	.09	.06	.02	.01	T.	T.	T.	.02	.07	.14
14	.12	.10	.09	.07	.02	T.	T.	T.	T.	.02	.06	.14
15	.12	.11	.10	.06	.03	.01	.01	T.	.01	.03	.07	.13
16	.12	.10	.09	.07	.02	T.	T.	T.	T.	.02	.07	.14
17	.13	.10	.09	.06	.02	.01	T.	T.	T.	.02	.07	.13
18	.12	.11	.09	.07	.02	T.	T.	T.	.01	.02	.07	.14
19	.12	.10	.09	.06	.02	.01	T.	T.	T.	.02	.07	.14
20	.12	.10	.09	.07	.03	T.	T.	T.	.01	.02	.07	.14
21	.12	.11	.09	.06	.02	.01	T.	T.	T.	.02	.06	.14
22	.12	.10	.09	.07	.02	T.	T.	T.	.01	.02	.07	.14
23	.13	.10	.09	.06	.02	.01	T.	T.	T.	.03	.07	.14
24	.12	.11	.09	.07	.02	T.	T.	T.	T.	.02	.07	.14
25	.12	.10	.09	.06	.03	T.	T.	T.	.01	.02	.07	.14
26	.12	.10	.09	.07	.02	T.	T.	T.	T.	.02	.07	.14
27	.12	.11	.09	.06	.02	T.	T.	T.	T.	.02	.07	.14
28	.12	.10	.09	.07	.02	T.	T.	T.	.01	.02	.06	.14
29	.12	------	.09	.06	.02	T.	T.	T.	T.	.02	.07	.14
30	.13	------	.10	.07	.03	T.	.01	T.	T.	.03	.07	.13
31	.12	------	.09	------	.02	------	T.	T.	------	.02	------	.14
Monthly normals	3.77	2.89	2.81	1.95	.68	.12	.03	T.	.11	.66	2.06	4.32

Yearly normal precipitation, 19.40 inches.

Note.—T. means a trace of precipitation.

Date of First and Last Light and Killing Frosts, and Date of Blooming Fruit Trees, in Sacramento.—The following table of first and last light frosts, first and last killing frosts, along with the lowest temperature, and also the dates at which fruit trees were first noticed beginning to bloom, and the dates and amounts of snowfall for nineteen years, are from the records of Mr. Samuel H. Gerrish, a local and voluntary meteorological observer of the Signal Service, who furnished this data for publication:

Year.	First Light Frost of the Season.	Minimum Temperature—First Light Frost.	First Killing Frost of the Season.	Minimum Temperature—First Killing Frost.	Last Light Frost of the Season.	Minimum Temperature—Last Light Frost.	Last Killing Frost of the Season.	Minimum Temperature—Last Killing Frost.	First Appearance of Blossoming Fruit Trees.
1869-70	November 8,1869	40	November 30, 1869	31	May 17, 1870	41	March 8, 1870	31	February 21,1870
1870-71	October 24, 1870	36	October 27, 1870	30	April 19, 1871	40	March 18, 1871	31	March 8, 1871
1871-72	October 25, 1871	37	November 6, 1871	30	April 12, 1872	38	January 9, 1872	27	February 26, 1872
1872-73	October 22, 1872	37	November 10, 1872	27	April 6, 1873	34	April 5, 1873	27	February 16,1873
1873-74	October 16, 1873	33	October 17, 1873	31	April 14, 1874	38	March 19, 1874	28	February 14,1874
1874-75	October 29, 1874	39	November 20, 1874	29	April 7, 1875	31	April 6,1875; coldest ever known	24	February 21,1875
1875-76	October 28, 1875	38	No killing frost; coldest on December 21,1875	35	April 8, 1876	38	January 16, 1876	29	February 20,1876
1876-77	November 3,1876	36	November 13, 1876	29	April 23, 1877	42	February11, 1877	32	February 2, 1877
1877-78	October 31, 1877	33	November 1, 1877	31	March 9, 1878	39	January 12, 1878	30	February 1, 1878
1878-79	October 16, 1878	37	October 28, 1878	29	April 15, 1879	41	February 6, 1879	27	February 15,1879
1879-80	October 8, 1879	39	November 27, 1879	25	April 18, 1880	37	March 30, 1880	28	February 29,1880
1880-81	October 31, 1880	35	November 13, 1880	28	March 18, 1881	33	March 17, 1881	31	February 22,1881
1881-82	October 4, 1881	36	November 11, 1881	30	May 15, 1882	41	March 9, 1882	29	February 28,1882
1882-83	October 5, 1882	42	November 13, 1882	27	May 2, 1883	41	February18, 1883	29	February 19,1883
1883-84	October 16, 1883	39	November 4, 1883	31	April 17, 1884	43	February18, 1884	31	February 20,1884
1884-85	September30,1884	41	November 30, 1884	31	April 22, 1885	41	January 26, 1885	31	February 10,1885
1885-86	October 11, 1885	38	No killing frost; coldest on December 28,1885	34	April 14, 1886	39	January 10, 1886	27	February 8, 1886
1886-87	October 9, 1886	40	November 4, 1886	32	May 10, 1887	34	February 26,1887	26	January 28, 1887
1887-88	October 20, 1887	37	November 25, 1887	28	April 26, 1888	38	February 3, 1888	28	January 20,1888
1888-89	October 19, 1888	37	November 6, 1888	28	March 19, 1889	40	February19, 1889	26	February 3, 1889

Dates of Snowfall in Sacramento and the Amount Precipitated.—January 29, 1862, .75 of an inch. January 12, 1868, 1.62 inches. December 3, 1873—6.00 inches. April 5, 1875, a trace; enough to whiten the ground before it melted. This was the coldest April ever known. A very light trace on January 13, 1879. January 26, 1880, estimated about .25 of an inch; it mostly melted as it fell. February 17 and 18, 1882, light trace. December 31, 1882, estimated about 4.00 inches; measured 1.50 inches actual measurement. February 1 and 6, 1883, a very light fall of snow. January 4, 1888, 2.89 inches. January 5, 1888, 3.00 inches. The snow that fell on the fifth was very damp and packed hard; if it had been as light as that on the fourth, I think we would have had over 6.00 inches. January 16, 1888, a trace.

Highest Temperature at Florin, Sacramento County.—The following record of the highest temperature for each month of the year, and for each year from 1879 to 1888, inclusive, was furnished by Mrs. W. H. Robinson, of Florin, Sacramento County, California:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Highest During the Year.
1879	63	79	78	87	93	102	103	105	98	90	76	66	105 in August.
1880	66	68	77	83	94	96	103	100	98	90	82	66	103 in July.
1881	70	72	88	90	96	99	103	98	100	82	78	60	103 in July.
1882	65	67	82	89	98	98	102	102	104	80	74	69	104 in September.
1883	66	75	81	78	98	107	108	103	104	86	71	65	108 in July.
1884	64	74	77	86	94	95	101	101	97	87	89	60	101 in July and Aug.
1885	69	72	82	86	102	94	101	109	103	102	76	66	109 in August.
1886	67	74	76	86	96	102	110	107	101	88	72	70	110 in July.
1887	65	68	83	88	110	111	105	104	105	97	77	66	111 in June.
1888	65	79	79	92	93	99	106	110	110	92	80	65	110 in Aug. and Sept.
Highest for each month	70 in 1881.	79 in 1879,'88.	88 in 1881.	92 in 1888.	110 in 1887.	111 in 1887.	110 in 1886.	110 in 1888.	110 in 1888.	102 in 1885.	89 in 1884.	70 in 1886.	111 in 1887.

Lowest Temperature at Florin, Sacramento County.—The following record of the lowest temperature for each month of the year, and for each year, from 1879 to 1888, inclusive, was furnished by Mrs. W. H. Robinson, of Florin, Sacramento County, California:

Year.	January	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Lowest During the Year.
1879	31	32	32	41	42	46	52	56	54	40	34	26	26 in December.
1880	30	30	30	42	40	51	53	54	50	42	27	40	27 in November.
1881	34	40	34	45	44	46	50	49	46	32	28	30	28 in November.
1882	24	25	27	36	30	45	50	53	47	33	29	24	24 in Jan. and Dec.
1883	19	22	39	37	40	48	54	50	50	37	23	22	19 in January.
1884	27	21	34	40	41	53	53	52	45	38	31	20	20 in December.
1885	31	32	40	32	46	42	54	52	47	40	36	35	31 in January.
1886	28	39	36	36	40	50	52	54	47	37	29	29	28 in January.
1887	28	27	31	41	41	44	51	51	46	42	23	21	21 in December.
1888	19	30	38	40	41	50	53	54	55	43	36	36	19 in January.
Lowest for each month	19 in 1883,'88.	21 in 1884.	27 in 1882.	32 in 1885.	30 in 1882.	42 in 1885.	50 in 1881,'82.	49 in 1881.	45 in 1884.	32 in 1881.	23 in 1883,'87.	20 in 1884.	

Rainfall at Folsom, Sacramento County.—The rainfall data tabulated below is from Folsom, Sacramento County, and was furnished by J. H. Sturges, special River Observer of the United States Signal Service at that point. The rainfall is from September, 1871, to date:

Year.	January.	February	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1871	------	------	------	------	------	------	------	------	sprin.	.55	1.95	13.12	------	1871–72	28.82
1872	5.50	4.72	1.60	.63	.75	sprin.	none	sprin.	sprin.	.25	2.80	6.53	22.78	1872–73	15.69
1873	1.64	4.05	.34	.05	.03	none	.01	sprin.	sprin.	sprin.	1.39	10.51	18.02	1873–74	24.46
1874	5.26	2.63	1.82	2.03	.81	sprin.	sprin.	none	sprin.	1.66	5.19	.13	19.53	1874–75	15.70
1875	6.14	.04	1.24	sprin.	.07	1.23	none	none	none	.26	7.12	4.49	20.59	1875–76	30.24
1876	5.89	4.06	6.62	1.56	.24	sprin.	.26	.03	none	3.76	.25	none	22.67	1876–77	10.19
1877	3.38	.68	.81	sprin.	1.02	sprin.	sprin.	sprin.	none	.75	.54	1.34	8.52	1877–78	25.00
1878	8.41	8.37	4.23	1.10	.26	none	none	sprin.	.12	.43	.62	.56	24.10	1878–79	21.91
1879	4.87	4.94	5.43	3.38	1.44	.12	none	sprin.	none	1.21	2.20	3.19	26.78	1879–80	25.09
1880	1.51	2.13	1.40	11.39	2.06	none	sprin.	none	none	sprin.	.10	9.85	28.44	1880–81	25.91
1881	6.70	6 07	1.38	1.13	sprin.	.68	none	none	.40	1.21	1.57	3.45	22.59	1881–82	18.68
1882	2.38	3.01	3.82	2.51	.27	.06	sprin.	none	.68	2.81	3.95	.74	26.23	1882–83	22.22
1883	2.11	.80	5.46	1.10	4.57	none	none	none	1.82	1.41	.81	.92	19.00	1883–84	31.02
1884	3.88	5.92	8.14	5.32	1.16	1.64	none	sprin.	.64	2.02	none	6.13	37.85	1884–85	16.58
1885	1.91	.84	.15	1 68	sprin.	.21	.02	sprin.	.21	sprin.	10.91	4.88	20.81	1885–86	34.75
1886	7.60	.90	3.16	6.78	.29	none	none	none	none	1.34	.55	3.35	23.97	1886–87	20.11
1887	1.27	9.21	1.30	2.84	.03	.22	none	sprin.	.38	none	.59	4.82	20.66	1887–88	16.28
1888	5.83	.84	3.08	.12	.35	.27	.02	.01	.57	none	3.71	4.32	19.12	1888–89	*17.31
1889	.32	.68	7.07	.61	------	------	------	------	------	------	------	------	------	------	------
Totals	74.60	59.89	57.05	42.23	13.35	4.43	.31	.04	4.44	17.66	44.25	81.33	375.66	------	382.65
Averages	4.144	3.327	3.169	2.346	.785	.261	.018	.002	.247	.981	2.458	4.518	22.098	------	22.508

* Up to May 1, 1889.

THE COLD WAVE OF JANUARY, 1888.

The following notes on the cold wave of January, 1888, show that no such a polar current has visited this coast since 1854, which appears from the meager records obtainable, to have been, if anything, somewhat colder than the cold wave of January, 1888. The minimum generally in the Sacramento Valley was about 18°; and in the San Joaquin Valley, 12° to 18°. In the foothills, from 13° to 18°. South of Tehachapi, it ranged from 10° to 30°. It was also the coldest in Portland, Oregon, ever known; the thermometer fell to 2° below zero, Signal Service records. The lowest before this was 3° above zero, in January, 1875.

[From the "Daily Evening Bee," January 14, 1888.]

A Little Cold Weather, But None That Will do any Particular Damage.—Dr. Logan's Recorded Minimum Temperature Again Reached.—Southern California Has None the Best of Northern.

On Thursday the sun came out bright and warm, and the streets were thronged with pedestrians clad in summer attire. The peddlers were abroad merrily calling out: "Oranges, sweet oranges, 15 cents a dozen," and every one believed that the cold weather was over. Last evening, however, the "cold wave" returned, carried by a north wind fresh from the snow-clad Sierras. The wind was quite a vigorous one, and shutters and signs swung and banged during the night. The mercury took a dive toward the bottom of the thermometer, and the result was that when morning came there was a wintry aspect quite unusual in the northern citrus belt.

The sun came out clear and warm, however, and the frigidity of the atmosphere was soon modified, though pedestrians all during the day showed a preference for the sunny side of the street.

In the early morning there was ice on small ponds in the gutters and streets, and small boys gathered about the "smooth article" and gazed in wonder at the natural curiosity.

Coming at this season of the year, the cold snap has done no damage. In fact, judged from a hygienic standpoint, the desiccating north wind is a blessing, serving, as it does, to dry up and obliterate the germs which produce disease.

What the Signal Service Observer Says.—He Gives Some Valuable and Interesting Reading.

It has been said by some doubting Californians that Dr. Logan's minimum or lowest temperature of 19° during the cold winter of 1853–54 was not correct; that they did not believe that such a low temperature was recorded on that occasion. Let those persons hold their peace, for after a lapse of thirty-four years a second occurrence of such a low minimum temperature has made its appearance.

THE EARLY MORNING.

The Signal Service minimum thermometer at 4 o'clock this morning was 24°, and between that time and sunrise it had fallen to 19°, or exactly the same minimum temperature that Dr. Logan recorded in January, 1854.

It is to be hoped that the doctor's record will no longer be disputed, for the above shows that he was a painstaking and careful observer during the early days, when nothing was thought of but gold, gold, gold; but the doctor found it cold, cold, cold, for that particular year.

EVERY THIRTY YEARS.

Dr. Bennett, of England, says that about once in thirty years there is an extraordinary cold wave blows down the Alps Mountains to the north of the great citrus belt and winter resorts of Northern Italy. These exceptionally cold waves come rushing down the cañons and kill all orange and lemon trees that are not planted in protected places.

COLD WAVES IN FLORIDA.

Florida has such cold waves at certain intervals. It will be remembered when the last one visited that State; the average newspaper man of California came out in learned and labored articles to prove that such cold weather blasts could not possibly occur in California, although Dr. Logan's record was before them.

THE THREE CITRUS DISTRICTS.

To-day's minimum temperature shows that the three great citrus districts of the northern hemisphere are alike liable, at long intervals, to be visited by an exceptionally cold wave; therefore, let us be charitable toward other countries that boast of citrus belts.

THE BEST IN THE WORLD.

We all know that this, our glorious State, is the most free, finest, and best in the known world. The Signal Service reports at 4 o'clock A. M. show an extremely high barometer, accompanied by a cold wave in Washington Territory, Oregon, and California; in California, a gale from the north has been blowing all night, which is, in a measure, the cause of this extreme and very unusual low temperature at Sacramento, because it came directly off the snow and ice of the mountains, and moving so rapidly that it has no time to be warmed by slowly passing over the warmer region of the Sacramento and San Joaquin Valleys, but reaches us with almost the same breath that it left the mountains.

ICE IN THE RIVER.

Captain Foster, of the Steamboat Company, says this is the first time since 1854 that he has noticed ice floating down the Sacramento River. It has been floating down this morning, measuring about one sixteenth of an inch in thickness, and no doubt, these thin spiculæ of ice formed along the shores of the American and Sacramento Rivers above this city, and by the force of the high northerly winds were broken loose from the shores, grinding them together and blowing them into the current of the two streams mentioned above.

HIGHEST AND LOWEST TEMPERATURE.

The temperature at 4 A. M. was 24°; between that time and sunrise it fell to 19°; at 8:10 A. M. it was 21°; at 9:20 A. M. 23.5°; at 10:25 A. M. 26°;

at 11:30 A. M. 29.5°; 12, noon, 30°. The temperature, therefore, does not stand as high as the freezing point, which is 32°. Ice on the roof, in a tub thoroughly exposed to the full force and effect of the weather, was one and one tenth inches in thickness at 9:20 A. M., and at noon was the same. In fact, the hole that was cut to measure the ice was closed by a thin film of congelation.

Along the Railroad Lines—What the Thermometer Showed at Seven This Morning.

At 7 o'clock this morning the temperature was as follows at the railway stations indicated: Truckee, 25° below zero; Summit, 12° below zero; Cisco, 3° above zero, and six inches of snow; Emigrant Gap, 8°; Blue Cañon, 7°; Towles, 8°; Gold Run, 7°; Colfax, 16°; Auburn, 26°; Newcastle, 20°; Rocklin, 20°; Sacramento, 22°; Tehama, 34°; Nord, 17°; Chico, 20; Biggs, 25°; Marysville, 20°; Lincoln, 20°; South Vallejo, 22°; Napa, 26°; Calistoga, 24°; Suisun, 26°; Elmira, 25°; Davisville, 24°; Woodland, 20°; Knights Landing, 28°; Dunnigan, 29°; Williams, 23°; Willows, 28°; Orland, 22°; Corning, 26°; Red Bluff, 30°; Wheatland, 24°.

["Daily Record-Union," January 16, 1888.]

Cold Wave Once in Forty Years.—The Cold Wave of January, 1854, Almost Equaled by the Present Cold Spell.

For the second time in thirty-four years an extraordinary cold wave is sweeping down upon the Pacific Coast. The Signal Service reports show the minimum or lowest temperature on Saturday and yesterday (Sunday) to have been 19°. It has not been so low as that before since January, 1854, when the same temperature was recorded by the late Dr. Thomas M. Logan, the then meteorologist of this city. For the sake of comparison, I visited the city's free library to find a copy of the old "Sacramento Union" for January, 1854, but there were no copies so early as that date, in the library, of that particular paper. There was a copy of the Sacramento "Daily Democratic State Journal." From the columns of its local news I find considerable very interesting reading, just at present, for the citizens of our city. If the dates were left out, the articles would very well refer to the present almost unprecedented cold weather. The articles copied from the above named paper are as follows:

Saturday, January 7, 1854.—Yesterday was a clear, calm, cold day. We were shown ice yesterday morning, one and one quarter of an inch thick, the thickest ever seen, we believe, in Sacramento. The night of Thursday (5th) was unusually cold.

The following would do for a good description of the last three days of our present cold spell:

Monday, January 9, 1854.—The weather has been unusually cold the past three days Yesterday, in riding a short distance in the country, we noticed, as late in the day as 3 o'clock, ice in considerable quantities in the marshes by the roadside. Such an occurrence was never noted before.

To show that the cold wave of 1854 did not stop at Sacramento, the following article from the "Democrat" will prove:

Wednesday, January 11, 1854.—The Stockton "Journal" has been shown a piece of ice three inches thick, that was formed on Thursday (5th) night last.

The following certainly is applicable to our present cold spell; in fact, change the date to January 16, 1888, and the same words will apply to Sacramento now:

Friday, January 20, 1854.—This season is one of most extraordinary severity. From all we can learn never has its equal been known, even to that antiquated individual the oldest inhabitant. The ground yesterday morning (19th) was frozen at least two inches in depth, and ice was formed from one half to one and one half inches in thickness. Even the sun scarcely melted the ice, and the moment it ceased to shine upon any one spot freezing commenced. The air was clear, and the mountains loomed up covered to an immense height with snow. Indeed everything looked and felt like winter. We hope such unpleasant weather will not continue long.

Boys were skating yesterday (January 15, 1888), back of the roundhouse. Read the following, dated Saturday, January 21, 1854:

Skating in Sacramento.—The frost of night before last was by far the heaviest we have seen in this valley; the unplanked levee became as firm as the planked streets. Crystal formations were everywhere that damp had of late been, and to cap the climax, we beheld, when we arose yesterday morning, numerous little boys disporting themselves on a pond in Second Street, by cutting their names with their skates on the ice. How the ice got there we could account for, and where the boys came from we could imagine, but when we thought of the skates we came to a full stop. Whose speculative spirit thought of bringing skates to Sacramento?

Monday, January 23, 1854.—After a succession of most extraordinary cold days the weather moderated yesterday afternoon.

From the same paper and the same date I clip the following:

Frozen Over.—Sutter Lake was frozen over Saturday night and remained so all day yesterday; the ice was from one half to one inch thick. This never happened before—at least to the knowledge of any person now living in this region.

Tuesday, January 24, 1854.—The Stockton Slough was frozen over on Saturday night (21st) so that the steamer Clay had to beat her way through the ice. The like was never before known in that vicinity.

Wednesday, January 25, 1854.—The suspension of heavy and hard frost for the past two weeks have enabled our waterworks contractor to proceed with the reservoir.

Wednesday, January 25, 1854.—The recent cold weather caused quite a rise in the price of ducks, geese, etc., owing to ponds being frozen over so as to prevent them getting their accustomed food.

The following notes must mean Nevada County and not the State of Nevada, for much colder weather than that is experienced in the Sagebrush State:

Wednesday, January 25, 1854.—The people of Nevada may well complain of the cold, as the following from "Young America" will show: On Friday last the thermometer stood at 2:30 o'clock A. M., 4° below zero; 5 o'clock A. M., 8.5° below zero; 9:30 o'clock A. M., 7° below zero. This, we believe, is the coldest weather yet recorded in California. Ice formed four inches thick.

The above numerous though brief notes from the "Daily Democratic State Journal," show that the cold spell of January, 1854, lasted upwards of two weeks. Although the paper did not give any temperature figures, we find, by referring to the record of Dr. Logan for that month, that he records a minimum temperature of 19°, which is our minimum for Saturday and yesterday. It can be safely said that we are liable to an extremely cold wave along the entire Pacific Coast of the United States, every thirty or forty years.

The average temperature on Saturday and yesterday, was 28°; Saturday being 18° colder than the normal for that day, and yesterday 17° colder than the normal. The highest and lowest temperature was, for Saturday, 38° and 19°, and yesterday, 37° and 19°, with high northerly winds on Saturday, and brisk to gentle northerly winds yesterday.

An abstract from Dr. Logan's meteorological table for the month of January, 1854 (taken from the "Daily Union" of January thirtieth), shows

that during the week from the seventh to the fourteenth, the maximum temperature was 54°, the minimum 32°, and there were no rainy days during the week. From the fourteenth to the twenty-first there were three rainy days. The highest temperature was 69°, and the lowest 32°; the prevailing winds being from the south and southeast. The following week the wind ranged from the southeast to northwest, and there were two rainy days. The highest temperature was 49°, and the lowest 19°, on the morning of the twenty-first. During the last week the thermometer ranged from 56° to 28°, with two rainy days, and the prevailing winds were from the north and northwest. In his remarks Dr. Logan says:

The thermometer used for these observations is hung in still air of a northern exposure and protected from the influence of wind or sun. The observations are made at 8 A. M., 3 P. M., and 10 P. M. The minimum, therefore, which generally occurs during the night, has not been obtained. The degree of cold experienced during the month is unprecedented. Sutter Lake was frozen over on the sixth and on the twenty-first, and remained so all the day of the twenty-second. Ice formed in the city from the thickness of one to two and a half inches. The effect of such weather upon the health manifested itself in the extinguishment of intermittent fevers, which had been previously so prevalent, and an increase of catarrhal and other inflammatory affections of the respiratory organs.

ICE ON THE SLOUGHS.

Ice formed on Lake Como, alias China Slough, during the recent cold spell, to the depth of nearly an inch near the shore, and the whole surface of the slough was frozen over except a space of about eighty feet square near the eastern end. The mud-hens and ducks were forced into this small space, and consequently appeared more than usually numerous. The slough was never so nearly frozen over before; but in 1854, so says a prominent citizen and capitalist, the ice was much thicker near the southern shore, and afforded good skating for many people. The ice twenty feet from shore at that time was too thin to support a person, and thus the skaters were confined to a space about fifteen feet wide and nearly three hundred yards long. Last week ice about half an inch thick formed on the surface of the slough back of the roundhouse, and the north wind of Friday and Saturday blew water over it. The water froze almost immediately, and in a short time ice sufficiently thick to bear the weight of a heavy man was formed. Several parties who were so fortunate as to possess ice skates improved the occasion, and had a high old skating carnival. A short distance from the shore the ice was quite thin, but fortunately no one ventured far enough from land as to endanger their lives thereby, or to furnish the newspaper scribes with an interesting item.

Saturday morning thin pieces of ice which the stiff norther had broken off from the banks where the water was shallow, floated down the river, and was considered a great curiosity by the people. It was one sixteenth of an inch thick.

["Daily Evening Bee," January 18, 1888.]

FACTS ABOUT THE WEATHER.—A FORMER RESIDENT RELATES HIS EXPERIENCES IN SACRAMENTO.

Sergeant Barwick:

DEAR SIR: I noticed your report of weather statistics in Saturday's "Daily Bee," particularly the extracts from Dr. Logan's report of the weather for the winter of 1853 and 1854. Many times I have referred to that winter in conversation with others, as the coldest I have ever experienced since my arrival in California, July 4, 1849, and a resident of Sacramento from the fourteenth of the same month and year until April, 1861, and in other places until the commencement of the present cold wave.

During the cold spell mentioned above, I was doing business at the Big Tree Store, corner of Eighth and J Streets, Sacramento. I have no recollection of the day or date of the commencement of the cold wave in 1854. I kept no record. There had been a fall of snow, leaving about two and a half inches on the ground, and the weather cleared up that night very cold. I usually opened the store in the morning before daylight. Having occasion for some water to wash myself, I went in the rear to the pump and caught hold of the iron handle. My hand clung to it; experience told me it required very cold weather to freeze a moist hand to cold iron. Having a thermometer hanging on the outside of the house facing the east, an examination of the same was made with a lighted candle. The reading was 18° above zero, or 14° below the freezing point. This would make it 1° below Dr. Logan's reading. It was all of two weeks before the snow disappeared from sheltered places.

It is now thirty-four years since that cold wave passed over this State, and I have not seen any winter to compare with it until the present one of 1888.

Another circumstance I will relate, during the cold weather of 1854. I have no doubt many old settlers are yet lingering in Sacramento who will remember the cake of ice I placed on my platform scales, in front of my store on J Street. My well water was hard, and would not readily remove dirt when using it. To obtain soft water I had a large hogshead placed in the rear of the store to catch rain water from the roof. It was facing the north, and so sheltered the sun never shown upon it. The first morning after the cold wave set in, I noticed the water frozen in the hogshead. I requested all of our folks in the store not to break the ice until the cold spell had passed over; every night the freeze added thickness to that ice, and continued nearly two weeks before the temperature moderated above the freezing point. Even the snow in the sheltered places lay on the ground during that time. With a crowbar I broke the ice in that hogshead, taking from it a large block and placing it on my platform scales in front of the store on J Street, and measured the thickness. The sides next to the hogshead were eight and a half (8½) inches thick, and the center six (6) inches. The winter of 1854 was the longest cold spell I have any recollection of, until the present winter. The highest and lowest temperature at Oroville during the present time, up to and including yesterday, the sixteenth, was 56° and 20°.

Yours truly,

HIRAM ARENTS,
Voluntary Signal Service Observer.

Oroville, January 17, 1888.

The Cold Wave.—Records of Three Sacramento Observers at Different Points in the City.

The following interesting tabulated matter during January last shows the lowest temperature recorded by self-registering instruments in different parts of the city. Captain Foster, of the steamboat company, has his thermometer at his residence, southwest corner of Eleventh and F Streets. It is a Green's standard signal service self-registering instrument, and is exposed under a grapevine arbor about five feet from the ground, in his back yard, the two-story house breaking (somewhat) the force of the north winds.

S. H. Gerrish's is a Sixe self-registering thermometer, manufactured by Hicks, of London, England, and is situated in his back yard, at No. 1517

G Street, being on the north side of the street. The thermometer is exposed to the full effect of radiation to the sky, there being no covering over it, and is in the back yard subject to the full force and effects of the north winds, which are cold in winter and hot in spring, summer, and fall. Mr. Gerrish's thermometer is about five or six feet above the ground.

The Signal Service thermometer is a Green's standard minimum, self-registering instrument, exposed on the roof of the Signal Office building, at No. 117 J Street, sixty-one feet above the ground, and is in a single latticed shelter, Signal Service pattern. The wind blows through the shelter in all directions.

The table below shows that during the thirty-one days of January there were but two upon which each observer recorded the same minimum temperature, and singularly, too, the minimum temperature was the same on both the days, being 34° on both the twelfth and nineteenth. The wind was north, blowing nine miles per hour, and weather cloudy at 4 A. M. of the twelfth, and southwest four miles per hour and weather cloudy on the nineteenth.

Captain Foster's record and the Signal Service record were the same on eight days, as follows: Twelfth, 34°; thirteenth, 32°; seventeenth, 22°; nineteenth, 34°; twentieth, 38°; twenty-first, 41°; twenty-third, 49°; twenty-fourth, 42°. There were but three days upon which the records of Mr. Gerrish and the Signal Office coincided, those being the twelfth, 34°; nineteenth, 34°; and twenty-second, 45°.

The average difference during the month was as follows: Captain Foster 1.8° lower than the Signal Service, 1.1° higher than Mr. Gerrish, while the records of the latter gentleman show an average difference of 2.9° less than the Signal Service, and 1.1° less than Captain Foster.

There were sixteen days in January that were cloudy at 4 A. M. The average minimum temperature for those sixteen cloudy days at the above hour, was: Foster, 39.9°; Gerrish, 39.8°; Signal Service, 41.6°—making the latter only 1.7° higher than Foster, and 1.8° higher than Gerrish. The fifteen days that were clear or fair at 4 A. M., show an average minimum of 26.9° for Foster, 25.3° for Gerrish, and 29.5° for the Signal Service, making the latter 2.6° higher than Foster, and 4.2° higher than Gerrish. The greatest difference (6°) between the readings of Mr. Gerrish's thermometer and that of the Signal Service, occurred on the seventh, eighth, ninth, and sixteenth. At each time the wind was from the north, and gentle in velocity, and calm on the eighth. The weather was clear each day.

The least difference was 1°—on the first, fourteenth, twentieth, twenty-first, twenty-fourth, and twenty-sixth. The weather was rainy or cloudy on each day, except on the fourteenth, when it was blowing briskly from the north. There does not appear to be so much difference between the readings of the Signal Office and Captain Foster's as there is between the Signal Office and Mr. Gerrish's records. It appears from the above comparisons for January that, as a general thing, there is a difference of from 1° to 6° in clear weather between thermometers five feet above the ground, and those located sixty-one feet above. The difference is greater in calm weather, or during light to gentle winds, and when the temperature is below the freezing point. The least difference in clear weather usually occurs when it is quite windy—that is, when the wind is fresh to brisk and high. In cloudy weather there is less difference than in clear weather, because the clouds reflect the heat back to the earth, and prevent the rapid radiation from all substances growing on the earth's surface, and prevents the heat from escaping so rapidly from the earth's surface by radiation.

This table of comparisons will give a good idea of the various currents of air throughout the city. The Signal Office being near the river (within one block), its minimum should be a little higher, while Captain Foster's is about fifteen blocks, or over a mile, northeast of the Signal Office, and on the corner of a wide street, while Mr. Gerrish's place of residence and observation are very nearly one mile northeast of the Signal Office, and are situated in the middle of the block.

COMPARISON OF RECORDS.

JANUARY.	Minimum Temperature by Captain Foster's Thermometer.	Minimum Temperature by S. H. Gerrish's Thermometer.	Minimum Temperature by Signal Service	Wind Direction, Signal Service, 4 A. M.	Wind Velocity, Signal Service, 4 A. M.	State of the Weather, Signal Service, 4 A. M.
1	39	39	40	S.E.	5	Light rain.
2	39	39	42	S.	1	Light rain.
3	40	40	44	S.W.	12	Light rain.
4	28	26	31	W.	5	Clear.
5	32	31	34	Calm.	0	Cloudy.
6	28	27	29	N.	4	Cloudy.
7	22	20	26	N.	6	Clear.
8	20	18	24	Calm.	0	Clear.
9	21	19	25	N.	4	Clear.
10	24	22	27	Calm.	0	Clear.
11	25	24	28	N.W.	2	Clear.
12	34	34	34	N.	9	Cloudy.
13	32	29	32	S.E.	7	Clear.
14	20	18	19	N.	27	Clear.
15	18	16	19	N.	9	Clear.
16	19	18	24	N.	6	Clear.
17	22	20	22	N.	8	Clear.
18	22	22	25	E.	4	Clear.
19	34	34	34	S.W.	4	Cloudy.
20	38	37	38	S.E.	3	Light rain.
21	41	40	41	S.E.	2	Cloudy.
22	46	45	45	Calm.	0	Light rain.
23	49	47	49	S.	6	Foggy.
24	42	41	42	S.W.	3	Cloudy.
25	46	45	48	Calm.	0	Cloudy.
26	40	40	41	N.W.	4	Fair.
27	46	45	48	S.W.	2	Cloudy.
28	44	43	46	S.E.	3	Cloudy.
29	50	49	51	S.E.	6	Cloudy.
30	48	46	52	S.E.	5	Fair.
31	42	41	48	S.E.	3	Fair.
Average	33.9	32.8	35.7	N. & S.E.	4.8	

Rainfall at Woodland, Yolo County.—Below we append a table of the monthly rainfall at Woodland, since 1873, taken from J. B. Elston's record, which is the standard gauge for Yolo County:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1873	1.25	2.84	.56	.18	none	none	none	none	none	.20	1.15	10.44	16.62	1872–73	10.22
1874	5.99	1.33	2.85	.64	.40	none	none	none	none	3.26	2.79	.16	17.42	1873–74	23.00
1875	5.22	.35	.66	none	.15	1.59	none	none	none	.44	3.87	2.49	14.77	1874–75	14.18
1876	4.40	4.85	4.24	1.40	.45	none	.16	none	.17	3.37	.27	none	19.31	1875–76	22.30
1877	3.95	1.42	.77	.03	.53	none	none	none	none	.94	1.10	1.29	10.03	1876–77	10.51
1878	11.52	7.61	2.30	1.25	.68	none	none	none	.25	.34	.88	.01	24.84	1877–78	26.69
1879	2.62	3.25	4.48	2.40	1.70	none	none	none	none	.22	7.15	3.66	20.48	1878–79	16.23
1880	1.33	1.22	.97	6.84	.28	none	none	none	none	none	none	8.73	19.37	1879–80	16.57
1881	4.50	1.93	.97	1.39	none	.35	none	none	.50	.25	1.87	2.37	14.13	1880–81	17.87
1882	1.24	1.87	2.34	1.51	.03	.07	none	none	.82	2.04	2.42	1.05	13.39	1881–82	12.25
1883	.91	.60	3.24	1.22	4.65	none	none	none	.54	1.04	.30	.54	13.04	1882–83	16.75
1884	3.67	4.07	6.53	4.03	none	3.02	none	none	.22	1.61	none	5.57	27.73	1883–84	22.75
1885	1.62	.15	.15	1.50	none	none	none	none	.06	.05	9.14	2.73	15.40	1884–85	10.82
1886	5.81	none	1.71	4.14	none	none	none	none	none	.59	none	1.39	13.64	1885–86	23.64
1887	.88	7.56	.75	1.90	none	none	none	none	none	none	.60	3.67	15.36	1886–87	13.07
1888	3.88	.97	2.80	.10	.77	none	none	none	.56	none	6.25	4.51	19.84	1887–88	12.79
1889	.19	.11												1888–89	*11.62
Totals	58.98	40.13	35.32	28.53	9.64	4.04	.16	none	3.12	14.35	32.79	48.61	275.37		269.84
Averages	3.469	2.361	2.208	1.783	0.602	0.269	0.011	none	0.195	0.884	2.049	3.038	17.211		16.865

*Up to March 1, 1889.

Maximum and Minimum Temperature of Auburn, and Rainfall for 1888.

January.	Max.	Min.	Rainfall.	February.	Max.	Min.	Rainfall.
1	46.0	35.0	.33	1	50.0	43.0	.46
2	52.0	40.0	.83	2	51.5	33.0	
3	54.0	41.0	2.02	3	55.0	33.0	
4	53.0	29.5		4	57.5	36.0	
5	39.5	30.5		5	56.0	33.5	
6	43.5	21.0	1.08	6	58.0	35.5	
7	40.0	17.0		7	58.0	34.0	
8	38.0	18.5		8	59.0	37.0	
9	41.0	13.0		9	57.0	36.5	
10	46.0	23.0		10	55.0	43.5	.06
11	48.0	28.0		11	59.5	48.0	.11
12	48.0	27.5		12	59.5	49.0	.37
13	48.5	32.0		13	57.0	39.5	.60
14	39.0	20.5		14	56.5	42.0	
15	38.0	18.5		15	62.0	38.5	.01
16	40.0	22.0		16	64.0	38.0	
17	44.0	25.5		17	57.5	39.5	
18	48.0	27.0		18	58.5	44.0	
19	50.5	37.0	.06	19	60.5	34.5	
20	54.0	38.0	.07	20	64.5	36.0	
21	55.0	43.5	1.51	21	69.0	41.0	
22	59.0	45.5	1.17	22	68.0	46.5	
23	59.5	50.0	.62	23	69.0	44.0	
24	59.0	43.0	.63	24	68.0	42.5	
25	65.0	47.0	.01	25	69.0	42.0	
26	63.0	42.5		26	71.0	44.0	
27	56.5	43.0		27	68.0	46.0	
28	58.5	46.0	.12	28	56.0	37.5	
29	57.0	47.5	.03	29	56.0	27.5	
30	63.0	44.0	.23				
31	61.0	43.5					
March.				**April.**			
1	48.0	31.0		1	59.0	41.5	.42
2	46.0	34.5	.46	2	62.0	41.0	
3	47.0	32.0	.65	3	59.0	41.5	
4	45.5	37.5	.37	4	68.0	41.0	.36
5	51.0	36.5	.73	5	63.0	37.0	
6	58.0	33.5	.26	6	70.5	40.0	
7	57.0	38.0		7	74.0	40.5	
8	59.0	41.5		8	79.0	41.0	
9	57.0	34.0		9	89.0	42.0	
10	58.0	34.5		10	86.5	44.5	
11	62.0	38.0		11	93.5	48.0	
12	67.5	41.0		12	94.5	55.0	
13	60.5	46.5	.08	13	96.0	53.5	
14	66.5	39.5	.30	14	97.5	56.5	
15	70.0	37.5		15	86.0	57.5	
16	77.0	44.0		16	85.0	48.0	
17	77.5	45.5		17	91.0	50.5	
18	69.0	46.0		18	91.0	53.5	
19	67.0	45.5		19	88.5	50.5	
20	81.0	43.5		20	90.5	54.0	
21	73.5	44.5		21	88.0	57.0	
22	69.5	46.5		22	78.0	50.0	
23	60.5	44.5		23	75.0	50.0	
24	62.5	39.5		24	70.0	46.5	.01
25	63.0	41.0		25	64.5	41.5	
26	72.0	38.0		26	73.5	39.5	.10
27	76.0	36.0		27	79.0	44.5	
28	68.0	39.5		28	89.5	53.0	
29	60.0	41.5		29	85.0	55.0	
30	56.0	41.0		30	77.0	45.0	
31	52.5	44.5	1.18				

January—Average maximum, 50.5. Average minimum, 33.5. Rainfall, 8.71 inches.
February—Average maximum, 60.3. Average minimum, 39.2. Rainfall, 1.61 inches.
March—Average maximum, 62.5. Average minimum, 39.8. Rainfall, 4.03 inches.
April—Average maximum, 80.1. Average minimum, 47.3. Rainfall, .89 of an inch.

AUBURN TEMPERATURE—Continued.

MAY.	Max.	Min.	Rainfall.	JUNE.	Max.	Min.	Rainfall.
1	71.0	43.0		1	69.5	56.5	
2	76.0	44.0		2	76.0	53.5	.11
3	68.0	44.5	.01	3	70.0	47.5	.05
4	74.0	46.5	.26	4	73.0	45.5	
5	78.0	46.5		5	83.0	49.0	
6	79.0	52.0		6	71.0	48.5	
7	76.0	45.5		7	75.5	43.0	.15
8	80.0	46.5		8	84.5	50.5	
9	83.0	49.0		9	82.5	57.0	
10	84.5	53.5		10	81.0	48.0	
11	90.0	52.0		11	87.0	54.0	
12	88.0	59.0		12	80.0	52.5	
13	78.5	59.0		13	81.0	56.0	.05
14	78.5	49.5		14	79.5	58.0	
15	69.0	47.5		15	77.0	53.0	.27
16	78.0	49.0		16	79.0	49.0	
17	78.0	48.0		17	70.5	51.5	.13
18	78.0	49.5		18	76.0	47.0	.28
19	72.0	44.0		19	70.5	51.5	.07
20	71.0	39.0		20	86.0	50.0	.08
21	74.0	38.0		21	92.0	59.0	
22	70.0	42.0		22	94.5	62.0	
23	68.0	42.5		23	91.0	58.0	
24	68.0	44.0		24	90.5	55.0	
25	64.0	43.5	.20	25	86.0	55.5	
26	68.0	47.0	.29	26	91.0	57.0	
27	76.0	43.5		27	84.0	54.0	
28	84.0	52.0		28	76.0	48.5	
29	86.0	53.0		29	79.5	48.5	
30	80.0	57.0		30	85.0	50.5	
31	76.5	56.0					

JULY.				AUGUST.			
1	93.0	55.0		1	82.0	45.5	
2	95.0	59.0		2	84.0	49.0	
3	99.0	62.0		3	89.0	53.5	
4	93.0	62.5		4	93.0	57.5	
5	90.0	54.0		5	96.0	59.5	
6	93.0	55.5		6	100.0	63.0	
7	88.5	52.5		7	103.0	64.0	
8	82.0	47.0		8	100.0	68.0	
9	84.0	47.5		9	91.5	52.0	
10	82.5	49.5		10	96.0	58.0	
11	76.0	53.5		11	98.0	62.0	
12	81.0	48.5		12	100.0	63.0	
13	90.5	53.5		13	101.5	63.0	
14	97.0	60.0		14	100.5	63.5	
15	102.0	63.0		15	94.0	59.0	
16	105.0	70.0		16	87.0	51.0	
17	100.0	69.5		17	90.0	51.0	
18	101.0	69.0		18	96.0	54.5	
19	99.5	66.0		19	91.0	60.0	
20	101.0	68.0		20	102.5	63.0	
21	96.0	70.0		21	101.5	62.0	
22	100.5	67.0		22	100.0	66.5	
23	97.0	65.5		23	111.5	71.5	
24	92.0	64.0		24	110.0	71.5	
25	87.0	53.0		25	100.0	70.0	
26	86.5	52.0		26	92.0	64.0	
27	90.0	51.0		27	105.0	70.0	
28	88.0	49.0		28	108.5	70.0	
29	91.5	51.0		29	101.5	76.0	
30	89.5	60.5		30	100.0	73.0	
31	76.0	51.0		31	105.5	74.0	

May—Average maximum, 76.2. Average minimum, 47.9. Rainfall, .76 of an inch.
June—Average maximum, 80.8. Average minimum, 52.3. Rainfall, 1.19 inches.
July—Average maximum, 91.8. Average minimum, 57.7.
August—Average maximum, 97.7. Average minimum, 62.2.

AUBURN TEMPERATURE—Continued.

SEPTEMBER.	Max.	Min.	Rainfall.	OCTOBER.	Max.	Min.	Rainfall.
1	108.0	78.0		1	76.0	53.0	
2	100.0	74.0		2	78.0	54.0	
3	104.0	75.0		3	79.5	58.0	
4	94.0	70.0		4	84.0	59.0	
5	100.0	50.0		5	83.5	60.0	
6	105.5	65.0		6	76.0	50.0	
7	106.0	70.0		7	75.5	50.0	
8	106.0	74.0		8	77.0	49.0	
9	99.0	71.0		9	81.0	55.0	
10	106.5	78.5		10	85.0	60.0	
11	103.0	80.0		11	88.5	61.0	
12	102.0	75.0		12	86.0	60.0	
13	95.0	70.0		13	81.0	49.0	
14	96.0	64.0	.05	14	82.0	56.0	
15	85.0	69.0	.25	15	84.0	57.0	
16	83.0	64.0		16	78.0	53.0	
17	87.5	56.0		17	69.0	48.0	
18	92.0	57.0		18	84.0	55.0	
19	96.0	60.0		19	78.0	50.0	
20	95.0	60.0		20	86.5	47.0	
21	94.5	62.0		21	78.0	52.0	
22	93.0	58.0		22	82.0	55.0	
23	86.0	61.0		23	79.0	50.0	
24	96.0	65.0		24	68.0	52.0	
25	96.0	66.0		25	68.0	48.0	
26	96.5	70.0		26	69.0	45.0	
27	94.0	70.0		27	73.0	48.0	
28	84.0	60.0		28	78.0	50.0	
29	78.0	58.0		29	78.0	54.0	
30	74.5	58.0		30	67.5	49.0	
				31	65.0	48.0	
NOVEMBER.				DECEMBER.			
1	68.0	43.0		1	49.0	37.0	
2	72.0	45.0		2	63.0	42.0	.57
3	65.0	48.0		3	55.0	36.0	.02
4	63.0	42.0		4	57.0	40.0	
5	63.0	39.0		5	58.0	40.0	
6	65.0	40.0		6	53.5	38.0	
7	69.0	41.0		7	48.0	31.0	
8	70.0	43.0		8	51.0	33.0	
9	69.0	44.0		9	54.5	41.0	1.21
10	70.0	45.0		10	55.0	46.0	.11
11	65.0	43.0		11	60.0	39.0	.36
12	66.0	45.0		12	56.0	39.0	.32
13	66.0	46.0		13	55.0	30.0	
14	65.0	48.0		14	50.0	31.0	1.54
15	65.0	49.0		15	52.0	42.0	.11
16	63.0	53.0	.61	16	59.0	53.0	.65
17	63.0	52.0	.95	17	59.5	40.0	.04
18	63.0	50.0	1.17	18	66.0	38.0	
19	65.0	47.0		19	63.0	40.0	
20	67.0	8.0		20	60.0	45.0	
21	67.5	8.0	.74	21	59.0	45.0	
22	52.0	3.0		22	57.0	48.0	.06
23	59.0	7.0	.35	23	57.0	44.0	.64
24	61.0	39.0		24	54.0	40.0	
25	56.0	40.0		25	53.0	40.0	.16
26	58.5	42.0	.36	26	54.5	45.0	
27	60.5	41.0		27	54.0	38.0	
28	56.0	30.0		28	54.0	32.0	
29	52.5	29.0		29	52.5	36.0	
30	56.5	33.0		30	53.0	32.0	
				31	53.5	31.0	

September—Average maximum, 95.2. Average minimum, 66.2. Rainfall, .30 of an inch.
October—Average maximum, 80.5. Average minimum, 52.7.
November—Average maximum, 63.0. Average minimum, 42.7. Rainfall, 4.18 inches.
December—Average maximum, 55.0. Average minimum, 39.1. Rainfall, 5.79 inches.

Average maximum for 1888, 74.4. Average minimum for 1888, 48.7. Total rainfall during 1888, 27.46 inches.

Rainfall at Iowa Hill, Placer County.—Record of rainfall kept by C. F. Macy, from January 1, 1879, to June 1, 1883, at Strawberry Flat, near Iowa Hill; altitude, 3,225 feet; and from June 1, 1883, to April 1, 1889, at Iowa Hill, Placer County; altitude, 2,825 feet above sea level:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1879	12.50	12.50	18.25	7.87	3.25	.25				3.50	3.63	13.35	75.10		
1880	5.00	6.10	7.88	18.87	6.25					.75	.75	20.80	66.40	1879–80	64.58
1881	20.75	10.50	4.62	3.15	.13	2.12			2.50	4.25	3.90	10.56	62.48	1880–81	63.87
1882	8.92	6.80	10.43	7.59	1.55	.73			.35	8.50	6.63	2.69	54.19	1881–82	57.23
1883	4.37	4.24	10.63	3.67	7.22				.75	4.54	2.02	3.75	41.19	1882–83	48.30
1884	8.05	11.26	16.50	13.22	1.60	2.52			1.60	2.43			24.22	81.40	1883–84	64.21
1885	3.03	1.48	.68	2.93	.05	1.60			1.20		15.82	6.14	32.93	1884–85	38.02
1886	10.89	.68	6.46	12.19	1.87					2.28	.80	5.75	40.92	1885–86	55.25
1887	3.61	15.61	2.23	6.55	.78	.07		.05	.48		.95	6.52	36.85	1886–87	37.68
1888	11.73	2.41	4.59	1.47	1.14	2.60	.06		.35		3.78	8.14	36.27	1887–88	32.00
1889	.58	.71	12.12	4.20										1888–89	*29.88

* Up to May 1, 1889.

Weather at Iowa Hill for 1888.—Summary of the weather record kept by C. F. Macy, at Iowa Hill, Placer County, for the year 1888:

Month.	Clear Days.	Fair Days.	Cloudy Days.	Rainy Days.	Rainfall—Inches.	Highest Temperature.			Lowest Temperature.			Mean Temperature.		
						7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.	7 A. M.	2 P. M.	9 P. M.
January	9	6	16	14	11.73	50			12			34.74		
February	16	6	7	5	2.41	53	74	59	28	46	33	43.10	59.80	46.80
March	15	6	10	9	4.59	56	74	58	31	36	33	43.77	57.51	46.35
April	22	3	5	3	1.47	65	87	68	40	52	42	54.86	73.13	57.90
May	19	6	6	3	1.14	68	86	70	46	56	46	56.50	72.20	57.93
June	13	5	12	7	2.60	71	87	72	49	55	47	59.86	73.13	60.86
July	23	6	2	1	.06	81	99	83	56	69	55	71.09	81.09	71.09
August	26	1	4			81	102	82	60	80	60	72.00	92.80	74.05
September	20	3	7	2	.35	82	102	84	61	68	62	71.93	91.06	72.93
October	25	2	4			67	90	70	46	64	49	58.26	78.22	60.93
November	15	4	11	8	3.78	54	74	57	38	54	42	47.40	63.40	49.67
December	5	7	19	14	8.14	54	69	55	36	45	38	44.10	55.13	46.35
Totals	208	55	103	66	36.27									

Georgetown, El Dorado County.—The rainfall at Georgetown, El Dorado County, was furnished by C. M. Fitzgerald, of the California Water and Mining Company, and extends from November, 1872, to date:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1872											4.30	18.72			
1873	4.08	13.05	3.05	3.11	.12	none	.03	none	none	.61	.55	16.60	41.20	1872–73	46.43
1874	16.66	8.03	13.87	5.80	1.32	.20	none	none	none	3.86	14.60	1.24	65.58	1873–74	63.67
1875	17.87	.04	5.07	.31	2.03	2.06	none	none	none	1.90	24.12	10.85	64.25	1874–75	46.31
1876	13.09	9.97	14.54	4.78	1.22	none	.77	none	none	11.47	.80	none	56.64	1875–76	81.24
1877	12.44	2.14	7.78	1.74	3.87	.24	none	none	none	1.03	4.30	1.97	35.51	1876–77	41.25
1878	16.21	22.78	10.92	2.99	.99	.12	none	none	.66	2.56	2.66	.48	60.37	1877–78	61.31
1879	11.24	12.41	17.57	9.65	3.39	.34	none	none	none	3.85	6.25	11.73	76.43	1878–79	60.96
1880	5.47	6.00	5.50	25.63	5.97	none	none	none	none	.18	.37	22.67	71.79	1879–80	70.40
1881	20.83	12.85	3.84	2.40	.40	2.28	none	none	2.02	4.23	3.30	10.32	62.47	1880–81	65.82
1882	8.59	5.88	10.44	7.11	2.06	.18	none	none	.16	7.75	7.00	3.31	52.48	1881–82	54.13
1883	4.70	3.08	8.73	3.87	7.34	none	none	none	1.60	4.10	1.94	3.50	38.86	1882–83	45.94
1884	7.53	13.80	19.94	15.07	1.52	3.65	none	.01	.80	3.54	.03	33.73	99.62	1883–84	72.65
1885	4.37	.82	.24	3.98	.19	2.28	.03	none	1.16	none	20.77	7.03	40.87	1884–85	49.99
1886	18.32	1.16	7.75	15.04	1.76	.06	none	none	none	3.43	1.79	6.90	56.21	1885–86	73.08
1887	3.36	15.79	2.40	6.54	.93	.18	none	none	.53	none	1.44	7.66	38.83	1886–87	42.12
1888	12.59	2.79	5.47	1.05	.38	1.56	.04	none	.41	none	4.67	7.99	36.95	1887–88	23.85
1889	.66	.68	12.29	2.77										1888–89	*29.51
Totals	178.01	131.27	149.40	111.84	33.49	13.15	.87	.01	7.34	48.51	98.89	164.70	898.06		899.05
Averages	10.471	7.722	8.788	6.579	2.093	.822	.054	.001	.459	3.032	5.817	9.688	56.129		56.190

*Up to May 1, 1889.

Weather Summary at Georgetown.

By C. M. Fitzgerald, Observer.

Summary for April, 1888.

Monthly mean temperature	54.7
Mean maximum temperature	64.1
Mean minimum temperature	45.4
Mean of the maximum and minimum temperature	54.7
Highest thermometer	77.8
Lowest temperature	34.0
Total number of clear days	16
Total number of fair days	4
Total number of cloudy days	10
Total number of foggy days	Part of one day.
Total number of days rain fell	8
Total rainfall	2.77
Hail fell	On thirteenth, at 2 and 4 P. M.

Summary for May, 1888.

Mean maximum temperature	69.5
Mean minimum temperature	47.2
Mean of maximum and minimum temperature	58.3
Highest thermometer	82.0
Lowest temperature	39.5
Total number of clear days	22
Total number of fair days	3
Total number of cloudy days	6
Total number of days rain fell	5
Total rainfall	.38
First early cherries ripe	May sixth.
First strawberries	May tenth.

Summary for June, 1888.

Mean maximum temperature	75.0
Mean minimum temperature	51.7
Mean of the maximum and minimum temperature	63.3
Highest thermometer	90.5
Lowest temperature	41.0
Total number of clear days	16
Total number of fair days	6
Total number of cloudy days	8
Total number of days rain fell	5
Total rainfall	1.56

Brilliant solar halos—eighth, eleventh, fourteenth, and twenty-third.

Summary for July, 1888.

Mean maximum temperature	89.6
Mean minimum temperature	61.9
Mean of the maximum and minimum temperature	75.7
Highest thermometer	98.7
Lowest temperature	45.5
Total number of clear days	29
Total number of fair days	1
Total number of cloudy days	1
Total number of days rain fell	1
Total rainfall	.04

Summary for September, 1888.

Mean maximum temperature	80.0
Highest thermometer	100.5
Total number of clear days	28
Total number of cloudy days	2
Total number of days rain fell	1
Total rainfall	.41

Summary for October, 1888.

Mean maximum temperature	74.3
Mean minimum temperature	50.2
Mean of the maximum and minimum temperature	62.2
Highest thermometer	84.0
Lowest temperature	43.7
Total number of clear days	26

Total number of fair days	4
Total number of cloudy days	1
Total rainfall	Sprinkle.
Total number of light frosts	2

Light sprinkle, inappreciable, on the twenty-fifth. First frost, very light, on the morning of the seventh; second frost, light, on the morning of the twenty-sixth. High wind from N.E. during night of seventeenth and following day.

Summary for November, 1888.

Mean maximum temperature	61.3
Mean minimum temperature	42.3
Mean of the maximum and minimum temperature	51.8
Highest thermometer	72.0
Lowest temperature	34.0
Total number of clear days	15
Total number of fair days	8
Total number of cloudy days	7
Total number of days rain fell	7
Total rainfall	4.67
Total number of heavy frosts	1

First heavy or killing frost occurred on morning of November twenty-first. Eggshell ice formed where water stood on boards. Lunar halo.

Summary for December, 1888.

Mean maximum temperature	54.5
Mean minimum temperature	39.1
Mean of the maximum and minimum temperature	46.8
Highest thermometer	68.0
Lowest temperature	31.5
Total number of clear days	11
Total number of fair days	6
Total number of cloudy days	14
Total number of days rain fell	13
Total rainfall	7.99

A little fog for a few hours on second and eleventh, on both days in afternoon. Lunar halo on twelfth, also on sixteenth. Hail fell at 4 P. M. of twenty-seventh.

Summary for January, 1889.

Mean maximum temperature	52.7
Mean minimum temperature	33.5
Mean of the maximum and minimum temperature	43.1
Highest thermometer	61.5
Lowest temperature	25.0
Total number of clear days	20
Total number of fair days	5
Total number of cloudy days	6
Total number of days rain fell	5
Total rainfall	.66

First snow thus far of the season fell on evening of seventeenth; just covered the ground; in the morning was about all gone.

Summary for February, 1889.

Mean minimum temperature	37.2
Lowest temperature	24.0
Total number of clear days	21
Total number of fair days	2
Total number of cloudy days	5
Total number of days rain fell	3
Total rainfall	.68

Summary for March, 1889.

Mean minimum temperature	41.4
Lowest temperature	32.0
Total number of clear days	15
Total number of fair days	4
Total number of cloudy days	12
Total number of days rain fell	12
Total rainfall	12.29

Placerville, El Dorado County.—The rainfall record at Placerville, El Dorado County, from October, 1879, to December, 1887, was furnished by Samuel Hale, Superintendent of the El Dorado Water and Deep Gravel Mining Company. After which time by Mr. Richard Rowland, Superintendent. Records were also kept from February, 1874, to February, 1877. The total for those years was, for eleven months in 1874, 33.23 inches; 1875, 44.84 inches; 1876, 39.21 inches; January and February, 1877, gave 11.05 inches:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1879										3.47	5.28	7.53		1879-80	52.60
1880	4.38	5.81	4.66	17.52	3.95	none	none	none	none	.35	.58	16.94	54.19	1880-81	48.04
1881	15.53	7.01	3.38	2.36	sprin.	1.89	sprin.	none	1.08	2.80	2.87	7.70	44.62	1881-82	42.46
1882	6.71	5.15	9.30	5.53	1.19	.13	sprin.	none	.93	5.72	4.94	1.98	41.58	1882-83	36.56
1883	3.74	2.58	6.88	3.54	6.25	none	sprin.	none	1.67	3.38	1.67	2.63	32.34	1883-84	57.36
1884	6.06	11.56	14.46	11.82	1.60	2.51	sprin.	.03	.85	2.47	.10	22.65	74.11	1884-85	36.56
1885	4.15	.97	.33	3.32	.27	1.42	none	none	.55	none	15.97	5.22	32.20	1885-86	54.63
1886	13.03	1.15	5.22	11.75	1.24	.50	sprin.	none	none	1.42	.91	5.02	40.24	1886-87	33.32
1887	3.18	14.18	2.09	5.71	.53	.28	none	none	.58	.06	1.42	8.34	36.37	1887-88	31.83
1888	11.27	2.39	5.26	0.91	1.10	.50	0.04	sprin.	.88	sprin.	5.98	7.06	35.39	1888-89	*25.63
1889	1.03	.86	9.78												

* Up to April 1, 1889.

Rainfall at Vacaville, Solano County.—The following table of rainfall was furnished by Mr. A. V. Stevenson, and shows a record of rainfall by months, years, and seasons, from 1880 to date:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1880	3.48	2.28	2.73	8.26	7.58	1.78	none	none	none	none	.07	21.25	47.43	1879-80	36.81
1881	15.61	4.58	1.13	2.36	none	none	none	none	none	.28	1.93	5.36	31.25	1880-81	45.00
1882	2.76	3.38	4.17	2.37	.19	none	none	none	1.10	3.11	3.77	1.15	22.00	1881-82	20.44
1883	2.45	2.11	6.26	2.03	5.63	none	none	none	none	2.24	.49	1.63	22.84	1882-83	27.61
1884	6.02	7.19	11.45	7.48	.24	none	none	none	.41	1.20	none	16.18	50.17	1883-84	36.74
1885	1.89	.28	.28	1.54	none	none	none	none	none	.30	15.98	5.68	25.95	1884-85	21.78
1886	8.74	.17	1.32	4.84	.05	none	none	none	none	.27	.14	2.26	17.79	1885-86	37.08
1887	1.34	9.40	1.06	2.65	none	none	none	none	.16	none	1.01	5.62	21.24	1886-87	17.12
1888	6.34	.45	4.21	.08	.04	.11	none	none	.71	none	5.77	5.35	23.06	1887-88	18.02
1889	.44													1888-89	*12.27
Totals	49.07	29.84	32.61	31.61	13.73	1.89	none	none	2.38	7.40	29.16	64.48	261.73		260.60
Averages	4.907	3.316	3.622	3.512	1.526	0.210	none	none	0.264	0.822	3.240	7.164	29.081		28.956

*Up to February 1, 1889.

Nicolaus, Sutter County.

Weather summary by months for 1888 at Nicolaus, Sutter County, furnished by Alvah Pendleton, Observer:

	January.				February.			
	1886.	1887.	1888.	1889.	1886.	1887.	1888.	1889.
Average temperature	47.82	48.27	43.17	46.69	55.00	44.77	52.26	50.38
Highest temperature	69.00	71.00	65.00	74.00	74.00	71.00	79.00	78.00
Lowest temperature	31.00	30.00	18.00	29.00	38.00	32.00	34.00	31.00
Monthly range of temperature	38.00	41.00	47.00	45.00	36.00	39.00	45.00	47.00
Greatest daily range	24.00	35.00	28.00	39.00	25.00	35.00	33.00	38.00
Least daily range	2.00	4.00	3.00	6.00	2.00	2.00	5.00	7.00
Average maximum temperature	53.48	59.58	51.19	59.25	62.89	53.75	65.38	63.81
Average minimum temperature	43.35	39.83	37.61	36.19	48.21	38.75	44.00	39.85
Mean daily range	10.13	9.75	13.58	23.06	14.68	15.00	21.38	23.96
Prevailing wind	S.	N.	N.	N.	N.W.	S.	N.	N.W.
Total precipitation	5.32	1.12	4.97	.14	.49	6.75	.70	.30
Total velocity of wind		3,563	3,969	3,133		3,937	3,926	3,032
Clear days	15	17	9	19	20	9	20	13
Fair days	2	1	4	4	4	3	3	6
Cloudy days	14	11	18	8	4	16	5	9
Days rain fell	10	6	15	3	6	12	4	3
Frosts	10	13	10	18	1	9	7	6

	March.			April.		
	1886.	1887.	1888.	1886.	1887.	1888.
Average temperature	52.45	59.56	57.49	56.58	60.71	65.30
Highest temperature	76.00	83.00	81.00	74.00	86.00	93.00
Lowest temperature	38.00	42.00	38.00	42.00	42.00	46.00
Monthly range of temperature	38.00	41.00	43.00	32.00	44.00	47.00
Greatest daily range	25.00	37.00	28.00	18.00	28.00	34.00
Least daily range	1.00	8.00	4.00	3.00	5.00	12.00
Average maximum temperature	59.93	72.12	67.51	63.56	71.43	79.76
Average minimum temperature	45.74	49.61	50.61	51.20	53.23	55.36
Mean daily range	14.19	22.51	16.90	12.36	18.20	24.40
Prevailing wind	S.E.	S.	S. & N.	S.W.	S. & W.	S.
Total precipitation	1.50	.96	2.83	4.93	2.22	.04
Total velocity of wind		3,470	6,471		4,669	3,180
Clear days	17	21	15	17	16	22
Fair days	5	2	2	2	4	3
Cloudy days	9	8	14	11	10	6
Days rain fell	12	4	8	12	8	1
Frosts	1	1	1	1	0	0

WEATHER AT NICOLAUS—Continued.

	MAY.			JUNE.		
	1886.	1887.	1888.	1886.	1887.	1888.
Average temperature	64.07	65.50	64.71	75.39	72.45	68.89
Highest temperature	88.00	102.00	91.00	100.00	102.00	95.00
Lowest temperature	53.00	46.00	54.00	60.00	50.00	56.00
Monthly range of temperature	35.00	56.00	37.00	40.00	52.00	39.00
Greatest daily range	24.00	31.00	29.00	24.00	31.00	26.00
Least daily range	5.00	10.00	11.00	4.00	10.00	10.00
Average maximum temperature	73.61	76.45	77.41	86.00	83.63	81.00
Average minimum temperature	59.70	57.38	57.45	69.00	66.01	63.30
Mean daily range	13.91	19.07	19.96	17.00	17.62	17.70
Prevailing wind	S.W.	S.	S.	N.W.	S.W.	S.W.
Total precipitation	.15	.01	.55	.00	3.04	.15
Total velocity of wind	3,461	4,509	4,883	----	4,375	4,200
Clear days	25	19	9	30	25	15
Fair days	1	4	9	0	3	14
Cloudy days	5	10	13	0	2	1
Days rain fell	1	4	5	0	3	4
Frosts	0	1	0	0	1	0

	JULY.			AUGUST.		
	1886.	1887.	1888.	1886.	1887.	1888.
Average temperature	79.79	75.04	75.52	78.02	72.40	76.52
Highest temperature	111.00	99.00	104.00	101.00	99.00	105.00
Lowest temperature	62.00	52.00	57.00	58.00	52.00	56.00
Monthly range of temperature	49.00	47.00	47.00	43.00	47.00	49.00
Greatest daily range	26.00	33.00	33.00	27.00	33.00	40.00
Least daily range	10.00	16.00	14.00	10.00	17.00	22.00
Average maximum temperature	88.53	90.00	90.60	91.80	87.93	96.32
Average minimum temperature	72.86	64.70	70.83	69.70	62.36	63.80
Mean daily range	15.67	25.30	19.77	22.10	25.57	32.52
Prevailing wind	S.W.	S.	S.	S.	S.	S. & W.
Total precipitation	.00	.00	.03	trace	.00	sprin.
Total velocity of wind	----	4,738	4,556	----	3,968	2,962
Clear days	31	27	26	29	24	29
Fair days	0	3	2	1	3	1
Cloudy days	0	1	3	1	4	1
Days rain fell	0	0	1	0	0	0
Frosts	0	0	0	0	0	0

WEATHER AT NICOLAUS—Continued.

	SEPTEMBER.			OCTOBER.		
	1886.	1887.	1888.	1886.	1887.	1888.
Average temperature	72.21	70.91	75.57	60.00	68.60	65.62
Highest temperature	99.00	100.00	106.00	92.00	96.00	90.00
Lowest temperature	54.00	54.00	58.00	41.00	50.00	44.00
Monthly range of temperature	45.00	46.00	48.00	51.00	46.00	46.00
Greatest daily range of temperature	41.00	38.00	39.00	36.00	36.00	36.00
Least daily range of temperature	20.00	15.00	13.00	4.00	14.00	20.00
Average maximum temperature	88.73	87.01	92.70	74.48	85.01	82.38
Average minimum temperature	61.13	60.56	65.03	49.64	60.51	53.53
Mean daily range of temperature	27.60	26.45	27.67	24.84	24.50	28.85
Prevailing wind	S.E.	S.	N.	N.W.	N.	S.
Total precipitation	.00	.01	.82	.89	.00	.00
Total velocity of wind	------	3,031	3,180	------	3,488	4,360
Clear days	27	21	23	20	27	25
Fair days	1	2	4	4	2	4
Cloudy days	2	7	3	7	2	2
Days rain fell	0	3	2	4	0	0
Frosts	0	0	0	2	0	1

	NOVEMBER.			DECEMBER.			
	1886.	1887.	1888.	1885.	1886.	1887.	1888.
Average temperature	52.95	54.30	53.04	50.77	50.00	48.91	49.93
Highest temperature	76.00	79.00	78.00	64.00	74.00	72.00	65.00
Lowest temperature	31.00	26.00	31.00	40.00	31.00	29.00	36.00
Monthly range of temperature	45.00	53.00	47.00	24.00	45.00	43.00	29.00
Greatest daily range of temperature	40.00	41.00	39.00	18.00	39.00	36.00	21.00
Least daily range of temperature	14.00	9.00	2.00	1.00	5.00	4.00	3.00
Average maximum temperature	66.96	69.53	66.06	54.03	61.01	61.74	59.25
Average minimum temperature	40.70	43.40	45.40	49.77	47.87	39.74	36.19
Mean daily range of temperature	26.26	26.13	20.66	4.26	13.14	22.00	23.06
Prevailing wind	N.	N.	N. & S.	------	N.W.	N.	S.
Total precipitation	.04	1.00	3.27	5.03	1.99	3.02	5.25
Total velocity of wind	------	2,398	3,152	------	------	5,084	2,739
Clear days	20	18	10	20	13	10	3
Fair days	2	2	0	1	4	4	3
Cloudy days	8	10	20	10	14	17	25
Days rain fell	2	4	7	10	12	10	14
Frosts	1	6	4	------	3	12	7

Rainfall at Grass Valley, Nevada County.—The rainfall that goes to make up the following table for Nevada County was taken at Grass Valley, by Mr. Loutzenheiser, beginning with January, 1873, to date:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1873	4.01	12.50	1.39	2.32	2.56	none	none	none	none	.83	2.99	19.01	45.61	1872–73	40.00
1874	13.71	6.93	11.71	3.76	1.05	.10	none	none	none	2.95	15.91	1.08	57.20	1873–74	60.09
1875	15.56	1.39	4.14	.29	1.18	2.28	none	none	none	.97	16.99	7.44	50.24	1874–75	44.78
1876	12.01	10.75	12.47	2.80	1.23	.65	none	none	.06	8.72	.62	none	49.31	1875–76	65.31
1877	10.18	2.44	4.79	1.14	1.40	.74	none	none	none	1.21	3.78	1.74	27.42	1876–77	30.09
1878	15.74	17.76	10.18	2.78	.59	none	none	none	.68	2.09	2.54	.75	53.11	1877–78	53.78
1879	10.72	11.51	18.07	7.08	3.08	.30	none	.08	none	2.79	6.54	8.86	69.03	1878–79	56.82
1880	6.40	4.83	4.07	23.31	6.23	.09	none	none	none	.04	.30	22.69	67.96	1879–80	63.20
1881	19.20	8.50	3.33	1.85	.05	1.50	none	none	1.25	3.71	3.52	8.21	51.12	1880–81	57.46
1882	6.03	6.30	7.96	5.29	1.18	.05	none	none	1.88	7.88	4.78	2.83	44.61	1881–82	43.93
1883	3.05	2.97	9.25	2.38	5.77	none	none	none	1.44	3.03	1.48	2.31	31.68	1882–83	40.79
1884	7.80	10.27	13.98	10.98	1.00	2.30	none	none	.98	3.30	.05	28.39	79.05	1883–84	54.59
1885	3.65	1.76	.83	3.17	.16	.90	none	none	2.65	none	19.27	6.36	38.75	1884–85	43.19
1886	12.40	1.43	4.83	11.33	1.09	none	none	none	none	1.66	.67	5.46	38.92	1885–86	59.41
1887	3.38	15.72	1.69	6.54	.64	.52	none	none	.26	none	1.38	6.85	36.98	1886–87	36.28
1888	11.81	2.59	5.22	.50	.38	2.21	.06	none	.50	none	4.03	7.94	35.24	1887–88	31.20
1889	.58	.97	11.93	3.56										1888–89	*28.60
Totals	157.23	118.62	125.84	89.11	27.59	12.09	.06	.08	9.70	39.18	84.85	129.92	776.23		780.92
Averages	9.249	6.978	7.402	5.242	1.724	.756	.004	.005	.606	2.449	5.303	8.120	48.514		48.808

* Up to May 1, 1889.

West Butte, Sutter County.—The report of rainfall at West Butte, Sutter County, was furnished by A. S. Noyes, and covers a period from November, 1879, to date:

Year.	January	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1879											2.38	2.25		1879–80	13.25
1880	.62	.75	.75	5.88	.62	none	none	none	none	none	none	5.38	14.00	1880–81	12.20
1881	3.69	1.38	.75	1.06	none	none	none	none	.31	1.12	.38	2.00	10.63	1881–82	12.26
1882	1.88	2.31	2.57	1.19	.50	none	none	none	·25	.88	2.62	.25	12.45	1882–83	12.44
1883	.75	.19	3.06	.88	3.56	none	none	none	.62	.81	none	.19	10.06	1883–84	19.80
1884	3.81	2.12	6.50	3.75	.25	1.75	none	none	.57	1.00	none	4.94	24.69	1884–85	12.13
1885	2.00	.50	.37	2.12	.18	.45	none	none	.18	.56	7.45	3.65	17.46	1885–86	23.10
1886	4.75	.70	1.50	4.19	.12	none	none	none	none	.50	.44	.67	12.87	1886–87	11.19
1887	.50	6.06	.82	2.20	none	none	none	none	none	none	.75	1.50	11.83	1887–88	10.55
1888	3.55	1.12	2.67	.30	.36	.30	none	none	.75	none	3.25	6.00	18.30	1888–89	*11.11
1889	.12	.36	5.78	.63											
Totals	21.67	15.49	24.77	22.20	5.59	2.50	none	none	2.68	4.87	17.27	26.83	132.29		126.92
Averages	2.167	1.549	2.477	2.220	.621	.278	none	none	.298	.541	1.727	2.683	14.699		14.102

* Up to May 1, 1889.

Temperature and Rainfall at Wheatland for the Year 1888.

Month.	Highest Temperature.	Lowest Temperature.	Mean Temperature.	Rainfall, in Inches.
January	64	19	42.9	4.13
February	78	33	52.3	1.06
March	77	37	53.7	2.42
April	91	42	63.9	0.16
May	92	49	64.7	0.38
June	93	49	69.2	0.35
July	106	52	75.7	0.02
August	107	53	78.8	0.00
September	109	53	77.0	0.32
October	90	42	66.1	0.00
November	77	32	53.4	2.69
December	60	35	48.1	5.06
Sums	1,044	496	745.8	16.59
Means	87	41.3	62.1	

Marysville Weather for 1888, and January, February, March, and April, 1889.

[From the "Marysville Appeal."]

The weather record for Marysville, in 1888, is remarkable for exceptional cold in the month of January, and an unusually high degree of heat in the months of August and September. The past year had the coldest winter and the warmest summer of any year in the history of the place, so far as any record exists. The "Appeal" has taken pains to note and publish, from day to day, the extremes of temperature and other weather observations, and these have all been carefully tabulated, from month to month, so that the paper is now enabled, for the first time, to present a complete annual abstract.

One of the peculiarities of the past year was that April was warmer than May, the average temperature for the latter month falling one tenth of a degree below that for April. Usually, May is considerably warmer than its predecessor.

Summary for the Year 1888.

Month.	Highest Temperature.	Lowest Temperature.	Average Maximum.	Average Minimum.	Monthly Mean.	Clear Days.	Fair Days.	Cloudy Days.	Rain—Inches.
January	67	18	49.7	35.3	42.5	15	6	10	6.03
February	76	33	64.6	42.3	53.4	25	1	3	1.29
March	81	35	69.0	43.2	56.1	20	2	9	3.47
April	93	40	82.3	52.3	67.3	27	1	2	.09
May	92	44	81.7	52.7	67.2	14	2	5	.47
June	99	52	86.0	58.0	72.0	22	3	5	.34
July	101	55	90.7	62.1	76.4	31	0	0	------
August	104	56	94.5	66.1	80.3	29	2	0	------
September	102	60	91.3	65.3	78.3	28	0	2	.43
October	88	43	0.0	53.8	69.1	27	4	0	------
November	72	36	63.0	44.8	55.7	18	5	7	4.66
December	64	36	56.0	44.6	50.3	6	6	19	6.63
Totals	------	------	------	------	------	272	32	62	23.46

The mean or average temperature for the year, was 63.9°.

The lowest temperature was 18° above zero, recorded on January fourteenth.

The highest temperature was 104°, recorded on August twenty-second.

There were fourteen dates on which the temperature fell to the freezing point or below. These were all in the month of January.

There were 68 days in which the temperature reached a maximum over 90°. Of these April had 3, May 3, June 7, July 16, August 24, and September 15.

Average winter temperature (December, 1877, January and February, 1888)	47.1°
Average spring temperature (March, April, May)	63.5°
Average summer temperature (June, July, August)	76.2°
Average fall temperature (September, October, November)	67.0°
Winter rainfall (1887–88)	10.68 inches.
Spring rainfall	4.03 inches.
Summer rainfall	0.34 inch.
Autumn rainfall	5.14 inches.
Total rainfall for season of twelve months, ending June 30, 1888	16.33 inches.

Despite the fact that the past winter was the coldest on record here, its average temperature compares favorably with that of Nice, France, which is one of the most favored winter resorts on the Mediterranean. The average winter temperature at Nice is 47.8°, while that of Marysville last winter was 47.1°. Our average spring temperature in 1888 was 63.5°, while the average of that season at Nice is but 56°. The comparison could be extended to many other famous foreign resorts, with credit to Marysville.

One of the great advantages disclosed by the local record is the remarkable number of clear days, which is characteristic of our climate. The total number of clear days in Marysville last year (272), is far above the annual average at any of the noted European health resorts, or any locality near the coast of Southern California. The days classed as "fair," it should be understood, may be considered as fine days, being but partially cloudy.

The total number of days last year on which rain fell, was 58, distributed as follows: January, 13; February, 4; March, 8; April, 2; May, 2; June, 5; July, 1; September, 1; November, 8; December, 14.

The readings of temperature from which the record is made up, are taken from an accurate self-registering instrument, exposed in conformity with Signal Service rules.

Summary for January, 1889.

Average maximum temperature	55.4
Average minimum temperature	36.6
Average for month, temperature	46.0
Highest temperature	63.0
Lowest temperature	31.0
Rainfall, inches	0.13
Number of clear days	22
Number of fair days	3
Number of cloudy days	6

Summary for February, 1889.

Average 28 maximum readings	60.2
Average 28 minimum readings	39.8
Average for month, temperature	50.0
Highest temperature	75.0
Lowest temperature	31.0
Rainfall, inches	0.36
Number of clear days	15
Number of fair days	12
Number of cloudy days	1

Summary for March, 1889.

Average 31 maximum readings	69.7
Average 31 minimum readings	48.2
Average for month, temperature	58.9
Highest temperature	90.0
Lowest temperature	41.0
Rainfall, inches	8.25
Number of clear days	16
Number of fair days	6
Number of cloudy days	9

Summary for April, 1889.

Average 30 maximum readings	74.5
Average 30 minimum readings	52.5
Average temperature for month	63.5
Highest temperature	83.0
Lowest temperature	42.0
Rainfall, inches	1.18
Number of clear days	19
Number of fair days	5
Number of cloudy days	6

Climate of Yuba and Sutter Counties Compared with the Eastern and that of Southern California.

[From the "Marysville Appeal."]

The climate, etc., of both Yuba and Sutter Counties, as well as of all other portions of this great and prosperous State, have been written up so fully and frequently of late that it is rather hard to produce anything that will be new in the way of comparative meteorology. The mean monthly average temperature for the counties named above, as deduced from observations of the railroad company for a number of years at Marysville, and of Mr. Lumbard of Wheatland, as well as the record of Alvah Pendleton of Nicolaus, will be compared with eastern points as obtained from the Chief Signal Officer's annual report. By these comparisons we find the mean average temperature of Yuba and Sutter Counties for December to be equivalent to spring in Philadelphia; the Atlantic Coast of Virginia; Pittsburgh, Pennsylvania; Columbus, Ohio; Keokuk, Iowa; and Arizona; also Paris and Cannes, in France; and the same as December in Naples and Rome, in Italy.

For January the mean average temperature is equivalent to spring in New York City, northern Ohio, central Iowa, and southern Colorado.

For February the mean average temperature is equivalent to autumn in Boston, Massachusetts; Albany, Buffalo, and Oswego, New York; Detroit, Michigan; Chicago; central Iowa; Omaha, Nebraska; southern Colorado; and Cannes, France.

The mean average winter temperatures for Yuba and Sutter Counties are equivalent to April in Philadelphia; the Atlantic Coast of Virginia and northern Ohio; central Iowa; Omaha, Nebraska; and Paris, France; and also equivalent to May in Rhode Island and the Upper Lake region, and the eastern slope of the Rocky Mountains, north of Cheyenne, Wyoming Territory.

The average winter temperatures for Yuba and Sutter Counties are higher than those of Naples, Mentone, San Remo, Rome, Pisa, Genoa, Nice, and Florence, Italy; and Toulon, Marseilles, and Cannes, France.

The average winter temperatures of the two counties above named, as compared with places in the southern portion of the United States, are the same as Montgomery, Alabama; Vicksburg, Mississippi; and warmer than the winters in North Carolina; Augusta and Atlanta, Georgia; Shrevesport,

Louisiana; Little Rock, Arkansas; any portion of Tennessee, and the greater portion of Texas and Arizona.

The above shows plainly and conclusively what all Sacramento Valley people know, and that is our winters are equivalent to spring in the Eastern States and as far south as Richmond, Virginia.

In the comparisons of the mean temperature by seasons with Marysville, Los Angeles, and Riverside, the figures make the average winter temperature the same at Marysville as Riverside, 50°; Los Angeles, 54°. Mean spring temperature: Riverside, 67°; Los Angeles, 58°; and Marysville, 63°. Mean summer temperature: Riverside, 74°; Los Angeles, 68°; and Marysville, 78°. Mean fall temperature: Riverside, 66°; Los Angeles, 63°; and Marysville, 66°.

The average winter and fall temperature is the same in Marysville as at Riverside, while the mean spring temperature is higher at Riverside by 4° than at Marysville, but Marysville is 5° warmer during the spring than is Los Angeles.

The average summer temperature, of course, is warmer in Sutter and Yuba Counties than in Los Angeles and Riverside, being 4° warmer than Riverside and 10° warmer than Los Angeles. Notwithstanding the great difference between the average summer temperature of Marysville and Los Angeles, the latter place has as high a temperature (maximum) as Marysville. In fact, Los Angeles can boast of a maximum temperature of 99° and over for every month from March to October, as the following figures will show, both being railroad maximum figures:

Los Angeles: March, 106°; April, 99°; May, 104°; June, 112°; July, 100°; August, 106°; September, 106°; October, 100°.

Marysville: March, 86°; April, 91°; May, 102°; June, 108°; July, 106°; August, 106°; September, 107°; October, 98°.

The lowest minimum temperatures from 1874 to 1885 (inclusive) for both places, by the railroad reports, were 24° at Marysville and 28° at Los Angeles.

The average number of clear days in winter at Los Angeles is 47, as against 38 in Marysville; spring, Los Angeles 35, Marysville 49; summer, Los Angeles 37, Marysville 85; fall, Los Angeles 55, Marysville 69.

Oranges color here in the fall before they do at Los Angeles, because we have a warmer average temperature for autumn, and an average of 14 more clear sunshiny days than does Los Angeles.

It has been said by Los Angeles people that Sacramento has hotter nights during summer than they. The Chief Signal Officer's annual report for 1887 gives the average (4 A. M.) temperature for nine years, and from that record the following comparisons with Sacramento are made:

Month.	Los Angeles, 4 A. M.	Sacramento, 4 A. M.
May	54	55
June	58	59
July	60	61
August	61	60
September	58	58

Highest temperature, Signal Service records:

Month.	Los Angeles.	Sacramento.
May	100	98
June	104	102
July	99	105
August	106	108
September	108	106
October	102	98

Los Angeles temperature has reached 100° in May and 102° in October, something the records do not show for Sacramento. The average summer temperature at 4 A. M. for Sacramento is 60°—exactly the same as at Los Angeles. The average summer temperature at 12 M. is 81° at Sacramento and 79° at Los Angeles. The average temperature at 7 P. M. is 72° at Sacramento and 66° at Los Angeles. This is an excellent showing for the capital city. Although the last named place is warmer during the evening, on an average, than Los Angeles, Sacramento is just as cool in the morning as is the southern metropolis.

From these comparisons it is self evident that the Sacramento Valley, as judged by the records at Sacramento and those at Los Angeles, is as pleasant during the summer as at the latter city.

The average rainfall for Sutter and Yuba Counties is twenty inches, which is somewhat above Los Angeles, and very much above Riverside and Colton.

The average summer temperature at Colton is the same as at Marysville (78°), while the average autumn temperature is 1° less at Colton than Marysville. The highest temperature ever recorded at Colton was 116°, and the lowest 20°, while at Marysville the highest temperature was 108° and the lowest 20°—all railroad figures.

This does not look as though the climate around Marysville was colder in winter and hotter in summer than that of the country around Colton, and as the latter is within a few miles of Riverside, the comparisons should be somewhat similar, if a record for the same length of time could be obtained from Riverside by railroad figures. Below will be found the time of planting and maturing of staple products of Yuba and Sutter Counties:

Kind.	Planting.	Maturing.
Wheat	December and January	June.
Barley	December and January	June and July.
Oats	January and February	June and July.
Corn	February and March	June to August.
Beans	February and March	May to July.
Peas	February and March	April to June.
Tomatoes	February and March	May to July.

Rainfall at Colusa, Colusa County.—The rainfall, etc., from Colusa was furnished by J. D. McNary. The table gives the rainfall by seasons from 1872–73 to date, and by months from 1881 to date:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1872															
1873														1872–73	33.46
1874														1873–74	11.28
1875														1874–75	19.02
1876														1875–76	19.79
1877														1876–77	9.20
1878														1877–78	33.34
1879														1878–79	13.98
1880														1879–80	19.21
1881	3.70	2.27	.60	1.42	.34	none	none	none	1.19	none	.43	2.51	12.46	1880–81	16.96
1882	1.51	2.56	2.50	1.27	.04	.65	none	none	.23	1.19	1.73	.69	12.37	1881–82	22.62
1883	1.07	.37	2.36	.79	3.23	none	none	none	.68	.68	.11	.10	9.39	1882–83	11.66
1884	4.82	2.30	5.70	2.97	.12	2.88	none	none	.59	1 06	none	5.30	25.74	1883–84	29.75
1885	2.04	.58	.35	1.22	none	.55	none	none	.02	.79	7.69	3.98	17.22	1884–85	11.69
1886	4.57	.20	.64	3.65	.10	none	none	none	none	.65	none	1.25	11.06	1885–86	21.64
1887	.42	5.97	1.17	1.91	none	none	none	none	none	none	.60	1.90	11.97	1886–87	11.37
1888	3.32	1.08	2.46	.30	.60	.39	none	none	.74	none	3.83	5.69	18.41	1887–88	10.65
1889	.30	.43												1888–89	*10.99

* Up to March 1, 1889.

Meteorological Data—Willows, California.

Furnished by Mr. David Bentley.

1888.	Maximum	Date	Minimum	Date	Mean Maximum	Mean Minimum	Monthly Mean	Monthly Range	Cloudy Days	Fair Days	Clear Days	Rainy Days	Mean Barometer	Rainfall	Prevailing Wind
January	63	27	17	15	50	35	42	46	14	7	10	9	30.12	3.68	N.
February	78	25	28	29	63	40	52	50	5	6	18	4	30.11	0.40	N.
March	78	16	32	5	65	41	53	46	6	6	19	6	30.03	1.69	S.
April	93	28	35	1	81	47	64	58	2	2	26	2	30.05	0.11	S.
May	100	12	43	23	84	51	68	57	5	4	22	1	29.93	0.16	S.
June	101	22	43	7	88	56	71	64	5	6	19	4	29.93	0.24	S.
July	111	20	51	8	99	61	80	60	1	1	29	1	29.97	0.06	S.
August	109	24	48	1	100	62	81	61	1	0	30	0	29.92	0.00	S.
September	109	11	52	29	95	62	79	55	1	3	26	1	29.91	0.38	N.
October	93	10	40	19	81	51	63	53	1	1	29	0	30.00	0.00	N.
November	74	1	33	11	64	45	55	41	9	4	17	7	30.08	3.33	N.
December	68	18	34	31	56	45	50	34	20	4	7	21	30.13	4.12	S.
	90	----	38	----	77	49	63	62	70	44	252	56	30.01½	14.17	S.

Seasonal Temperatures for Places in Colusa County.

	Princeton.	Williams.	Willows.	Orland.	College City.
Average winter temperature	48.2	47.5	45.7	52.6	48.4
Average spring temperature	61.4	61.7	63.0	65.1	63.3
Average summer temperature	78.7	79.6	81.5	81.7	76.6
Average fall temperature	63.3	63.6	64.5	67.6	60.9
Average yearly temperature	62.8	63.1	63.7	66.8	62.3
Highest temperature	114	114	112	113	114
Lowest temperature	19	19	19	22	19
Average rainfall—inches	15.25	12.09	12.03	16.36	16.35

Meteorological Record for the Year 1888, and Summary for the Years 1884–88, at Oroville, Butte County.

By Hiram Arents, of the United States Volunteer Signal Corps.

January, 1888—The cold wave that passed over the State this month was the longest continuous spell of cold weather and marked the lowest temperature of any period since 1849. It began January fourth, and was below 32° for fourteen days with but one exception. The following is from my daily record from Green's standard self-registering minimum thermometer: fourth, 30°; fifth, 28°; sixth, 30°; seventh, 26°; eighth, 25°; ninth, 27°; tenth, 29°; eleventh, 31°; twelfth, 29°; thirteenth, 39° (snow storm); fourteenth, 20°; fifteenth, 24°; sixteenth, 32°; seventeenth, 25°; eighteenth, 27°. On the thirteenth it moderated at 7:30 A. M.; the thermometer was 38°; a snow storm set in, lasting three hours; the snow melted as it fell, except on wooden situations. This was the first flake of snow seen in Oroville since February 11, 1884, when half an inch was left on the ground. The mean temperature for January was 45.40°, the lowest I have any record of, the average for the past five years being 49.52°. January, 1888, was 4° below the average. The highest temperature was 65°, or 4°

below the average; the lowest was 20°, or 10° below the average. The highest barometer was 30.52 on the seventeenth, the highest reading I have any record of; the lowest was 29.44; mean, 30.05. Clear days, 11; cloudy, 17; fair, 3. Rain fell for 13 days, and a trace on the 14th. Rainfall for the month, 7.72 inches; season, to date, 11.71 inches. Light frosts, none; heavy, none; hard, 13.

Summary for January, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	50.45	53.23	48.18	50.28	45.41	49.51
Highest temperature	70.00	74.00	66.00	70.00	65.00	69.00
Lowest temperature	35.00	34.00	29.00	32.00	20.00	30.00
Clear days	.....	16	18	24	11	17
Cloudy days	.....	12	11	5	17	11.1
Fair days	.....	3	2	2	3	2.2
Rainfall	.....	2.10	5.17	1.02	7.72	4.0
Season to date	.....	15.83	22.17	4.11	11.71	13.45
Light frost	.....	1	2	7	.....	2.2

February, 1888—Was a pleasant month; at no time was the temperature at the freezing point; less than one inch of rain fell. The mean temperature was 55.2°, or about 2° above the average for the last five Februarys; the highest was 79°, about 6° above the average; lowest, 34°, or 1° below the average. The almonds and apricot trees were in full bloom by the fifteenth instant. Highest barometer was 30.25; lowest, 29.70; mean, 29.98. There were 21 clear, 4 cloudy, and 4 fair days. It rained part of 5 days; rainfall, .99, and for the season to date, 12.70. Prevailing winds were southerly. Light frost occurred on the second, third, sixth, and seventh. Thermometer at 6 A. M. at each date was 39°, 34°, 35°, 37°.

Summary for February, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	49.46	59.16	57.10	47.30	55.20	53.53
Highest temperature	74.00	70.00	70.00	70.00	79.00	73.00
Lowest temperature	25.00	38.00	44.00	32.00	34.00	35.00
Clear days	.....	18	18	15	21	18
Cloudy days	.....	6	3	13	4	6.2
Fair days	.....	4	7	0	4	3.3
Rainfall	.....	0.73	0.36	8.93	0.99	2.75
Season to date	.....	16.56	25.53	13.65	12.70	17.40
Light frost	7	1	1	4	4	3.2

March, 1888—Came in with a cold rain storm lasting four days; the rain was 1.64 inches. Range of the thermometer during the four days, highest, 64°; lowest, 40°. Mean for March was 56.03°; this was 4° below the average for the last five years; highest temperature, 78°; lowest, 40°. Highest barometer, 30.38; lowest, 29.54; mean, 29.94. Clear days, 19; cloudy, 6; fair, 6. Days that rain fell, 9; rainfall, 3.44; season to date, 16.14. Prevailing winds, southerly. No frost. On the third, a hail storm with thunder and zigzag lightning, lasting about fifteen minutes, followed by a light rain for half an hour, measuring .18 of an inch. Thermometer, 48°; barometer, 29.73. This month the nectarine, peach, plum, pear, apple, and on the twenty-fourth orange and lemon trees were in bloom.

Summary for March, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	59.08	68.18	55.18	61.13	56.03	59.92
Highest temperature	80.00	86.00	75.00	84.00	78.00	80.00
Lowest temperature	40.00	46.00	40.00	37.00	40.00	40.00
Clear days		20	14	26	19	20
Cloudy days		6	13	3	6	7
Fair days		5	6	2	6	5
Rainfall		0.25	2.70	0.99	3.44	1.84
Season to date		16.81	25.23	14.31	16.31	18.17
Light frost	4	0	2	2	0	1.30

April, 1888—Was pleasant; the mean temperature was 66°, nearly 3° above the average for the last five Aprils. Highest for the month was 87°; lowest, 45°; highest barometer was 30.20; lowest, 29.77; mean, 29.958. Clear days, 26; cloudy, none; fair, 4. Days rain fell, 2; rainfall, .14 of an inch; season to date, 16.28. Winds, southerly. No frost. Saturday, twenty-eighth, at 8:45 P. M., a shock of earthquake was distinctly felt in this city, preceding the same was a rumbling noise. The oscillation was slight, and seemed to come from the southeast to northwest, but the trembling was more severe, shaking buildings and alarming the inmates, but doing no damage. Duration, about five seconds.

Summary for April, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	60.53	64.75	60.28	62.12	66.00	62.94
Highest temperature	80.00	84.00	84.00	86.00	87.00	84.10
Lowest temperature	46.00	42.00	44.00	38.00	45.00	43.00
Clear days		13	13	21	26	18.10
Cloudy days		11	13	7	0	7.3
Fair days		6	4	2	4	4
Rainfall		1.64	5.48	2.81	0.14	2.27
Season to date		16.47	30.71	17.41	16.28	20.22
Light frost	0	0	0	0	0	0

May, 1888—Many persons considered May very cold, yet, when we compare the daily and monthly temperature with the former months of May, I find there was less variations and extreme changes between the highest and lowest temperature than any of the months mentioned. For instance, May, 1887, the highest temperature was 102°; lowest, 39°; average, 63°. 1888, highest, 90°; lowest, 51°; average, 69°; and yet the mean monthly temperature of this month was less than three fourths of a degree below the average of the last five years. The mean temperature was 69°, maximum, 90°; minimum, 51°; and the mean of the maximum was 77.1°, and of the minimum, 57.1°. Highest barometer, 30.02; lowest, 29.71; mean, 29.931. There were 21 clear, 6 cloudy, and 4 fair days. Rain fell on part of 5 days and a trace on 2. Rainfall for the month, .38 of an inch; season to date, 16.60. Prevailing winds, southerly. No frost. At 10 P. M. on the twelfth a light thunder storm passed over the town; course, from southeast to northwest; precipitation .05 of an inch. Also on the thirteenth at 4:30 P. M.; course, from east to west; rainfall, .05 of an inch.

Summary for May, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	68.82	72.13	68.45	70.01	69.02	69.86
Highest temperature	88.00	96.00	90.00	102.00	90.00	93.10
Lowest temperature	51.00	52.00	52.00	39.00	51.00	49.00
Clear days		24	25	24	21	23.20
Cloudy days		4	4	2	6	4
Fair days		3	2	4	4	3.10
Rainfall		0.65	0.50	0.08	0.38	0.40
Season to date		19.10	31.21	17.49	16.60	21.10
Light frost	0	0	0	0	0	0

June, 1888—The temperature of June compares favorably with June in 1884 and 1885, the mean for the three months 1884, 72.70°; 1885, 73°; 1888, 72.03, and the maximum 94°, 90°, 93°, and the minimum 56°, 57°, 57°, showing the mean maximum and minimum for the three months was nearly of the same temperature. The highest barometer for this month was 30.02; lowest, 29.67; mean, 29.828; clear days, 20; cloudy, 7; fair 3. Rain fell on part of 5 days and a trace on 3; rainfall, 1.16; for the season, 17.76. More rain fell this month than any June recorded. Prevailing wind, southerly; no frost. On the third of this month a thunder and lightning storm occurred; the precipitation was .34 of an inch. Also, two well defined solar circles appeared around the sun on the eighth and eleventh; the latter was described by me, and published in the "Oroville Register" of the fourteenth. This was the most brilliant one I have ever seen, and attracted crowds of people on the streets for hours viewing the extraordinary phenomenon.

Summary for June, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	72.70	73.00	79.12	76.09	72.03	74.59
Highest temperature	94.00	90.00	95.00	104.00	93.00	95.10
Lowest temperature	56.00	57.00	62.00	54.00	57.00	57.10
Clear days		21	30	24	20	24
Cloudy days		5	0	2	6	3.1
Fair days		4	0	4	4	3
Rainfall		0.39	0.00	0.18	1.16	0.43
Season to date		19.49	31.21	17.67	17.76	21.53
Light frost	0	0	0	0	0	0

July, 1888—Shows greater extremes of temperature than any July for five years. Although the mean temperature was an average one, 79.8°. The highest was 102°, nearly 2° above the average; the lowest, 56°, about 2° below the average. Extremes, 46°, nearly 5° above the average. There were more days the thermometer was above 90° than any of the past five Julys. In 1884 there were 15 days; 1885, 13; 1886, 14; 1887, 14; 1888, 16. Highest barometer, 30.18; lowest, 29.74; mean, 29.88. There were 28 clear days; 3 fair, none cloudy. There was .07 of an inch fell on the eleventh, the first rainfall recorded in July for five years. There was a trace on the seventeenth, twenty-first, and thirty-first, in 1885; there was a trace on the second, in 1866; and on the eighth, ninth, and twelfth, in 1887. Prevailing winds, southerly. No frost. A total eclipse of the moon occurred on Sunday, the eleventh; at 7:50 P. M. the moon entered the

shadow of the earth; the total eclipse beginning at 8:30 P. M. and ending at 10:30 P. M.; duration, one hour and forty minutes, During the passage of the earth's shadow across the moon, frequent flashes of diffused lightning was noticed in the east. No clouds were seen.

Summary for July, 1884 to 1888, at Oroville.

YEAR:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	79.76	78.80	81.16	78.75	79.08	79.51
Highest temperature	98.00	96.00	102.00	101.00	102.00	99.40
Lowest temperature	56.00	60.00	61.00	57.00	56.00	58.00
Clear days		31	30	30	28	29.30
Cloudy days		0	1	0	0	0.25
Fair days		0	0	1	3	1
Rainfall	.00	.00	.00	.00	.07	.01
Season to date	.00	.00	.00	.00	.07	.01
Light frost	0	0	0	0	0	0

August, 1888—Was one of peculiarities, although the mean temperature was an average one for the last five years. The maximum was the same as 1884, and 3° below 1885, yet the heat was more oppressive than either of these months, owing to the humidity of the atmosphere. It is seldom dew falls in this locality during the months of July and August. This year has been an exception to the past five; it could be plainly seen, almost every morning, on grasses and shrubbery. The latter part of this month warm nights prevailed—the twenty-ninth and thirtieth showed the highest temperatures at the 5 A. M. readings: At 5 A. M. on the twenty-ninth it was 76°; at 6 A. M., 72°; at 2 P. M., 92°; at 4 P. M., 105.5°, and at 9 P. M., 92°. The mean temperature for the twenty-four hours was 81.1°. During the nights of the twenty-ninth and thirtieth 82° was the lowest reading at 5 A. M. Number of days in August, for five years, the thermometer reached 90° and upwards: 1884, 24 days from 90° to 102°; 1885, 23 days from 90° to 105°; 1886, 16 days 90° to 96°; 1887, 10 days 90° to 97°; 1888, 23 days 90° to 102°. The mean temperature this month was 81.2°; maximum, 102°; minimum, 50°. Highest barometer, 30.02; lowest, 29.70; mean, 29.852. Number of clear days, 30; cloudy, 1; fair, none. No rain fell this month; for the season to date, 0.01 of an inch. Prevailing winds, southwesterly.

Summary for August, 1884 to 1888, at Oroville.

YEAR:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	82.17	82.11	81.16	76.22	81.02	80.54
Highest temperature	98.00	105.00	102.00	97.00	102.00	100.00
Lowest temperature	56.00	63.00	61.00	54.00	58.00	57.00
Clear days	30	25	30	30	30	29
Cloudy days	0	2	1	0	1	1
Fair days	1	4	0	1	0	1.1
Rainfall	.00	.00	.00	.01	.00	0
Season to date	.00	.00	.00	.01	.01	0
Light frost	0	0	0	0	0	0

September, 1888—Was the warmest month we have any record of. The mean temperature was over 5° above the average for the last five years. The highest for the month at 2 P. M. was, for the following dates, first, sixth, tenth, and eleventh, 102°, and at four P. M. on the first, sixth, and tenth, 103.5°; lowest at 6 A. M., 57°.

Commencing on the nineteenth of August and ending on September twelfth was the longest continuous spell of hot weather I have ever experienced. On the tenth and eleventh of September shows a higher daily mean temperature than in any other days of the present year—88.5° and 89°; the highest for these two days, 103.5°, 102°; lowest, 78° and 77.5°. On these two days the air was close and oppressive. Most people believe the temperature was higher than recorded. During the twenty-four days of this hot wave no time was the temperature below 90° at the 2 and 4 P. M. readings. The highest barometer was 30.00; lowest, 29.62; mean, 29.842; clear days, 25; cloudy, 2; fair, 3; days it rained, 3; trace, 1. Rainfall for the month, .63 of an inch, and the season to date, .70. Prevailing winds, southerly. At 6 A. M. on the fourteenth a light thunder and lightning shower of rain occurred. Its course was from north to south; precipitation, .04 of an inch. Also on the fifteenth three distinct thunder and lightning showers of rain. The one at 1 P. M. was the most severe; the peals of thunder were loud, and the flashes of lightning sharp, forked, and zigzag. Its course was from southeast to northwest; precipitation. .48 of an inch. Also one on the twenty-second passed east of town; course, north and south; precipitation, trace.

Summary for September, 1884 to 1888, at Oroville.

YEAR:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	72.73	69.25	74.19	75.25	80.00	74.28
Highest temperature	97.00	94.00	96.00	96.00	102.00	97.00
Lowest temperature	54.00	52.00	54.00	53.00	57.00	54.00
Clear days	21	21	30	20	25	25.2
Cloudy days	7	6	0	0	2	3
Fair days	2	4	0	4	3	2.3
Rainfall	2.27	.20	.00	.15	.63	0.65
Season to date	2.27	.20	.00	.16	.70	0.67
Light frost	0	0	0	0	0	0

October, 1888—Was one of the most pleasant and delightful months we have had for years, and at no time was the maximum temperature above 89°, and the minimum but five days below 50°. No rain or a trace fell this month. This has been the only October for five years I have not recorded a measure or trace. The mean temperature was 68°, nearly 2° above the average. Highest was 89°; lowest, 45°. Highest barometer, 30.12; lowest, 29.73; mean, 29.91. Number clear days, 30; cloudy, none; fair, 1. Rainfall, none; season to date, .70 of an inch. Prevailing winds, southerly. No frost this month. This mild and favorable October weather caused the oranges to commence coloring nicely, and before November expired many carloads were in condition for shipping.

Summary for October, 1884 to 1888, at Oroville.

YEAR:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	64.31	69.28	63.22	68.40	68.00	66.62
Highest temperature	87.00	94.00	87.00	91.00	89.00	89.30
Lowest temperature	46.00	52.00	43.00	45.00	45.00	46.10
Clear days	21	20	25	29	30	25
Cloudy days	7	6	5	0	0	2.20
Fair days	2	2	1	2	1	2
Rainfall	2.03	.00	.63	.00	.00	.54
Season to date	4.35	.20	.63	.16	.70	1.21
Light frost	0	0	0	0	0	0

November, 1888—The month just past has been one of slight variation in the temperature, and shows a better average than any of the Novembers of the last five years. The mean temperature was 56.5°, and the mean of the maximum 65.4°, and of the minimum 48°; the average would be 56.6°. The extremes between the mean maximum and mean minimum was but little over 17° for the entire month. The highest temperature for the month was 76° on the seventh; lowest, 38.5° on the fifth. Highest barometer, 30.18; lowest, 29.66; mean, 29.972. Number clear days, 22; cloudy, 6; fair, 2; foggy, 1. Days rained, 6—on the fifteenth, sixteenth, seventeenth, twentieth, twenty-second, and twenty-fifth. Rainfall, 4.14; for the season to date, 4.48. First frost of the season occurred on the twenty-seventh, and one the twenty-ninth; both were very light. Thermometer at 39° and 41°. Prevailing winds southerly.

Summary for November, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	61.67	57.10	53 08	58.00	56.40	57.90
Maximum temperature	76.00	74.00	76.00	80.00	76.00	76.20
Minimum temperature	40.00	42.00	31.00	31.00	38.50	36.70
Clear days	25	7	25	21	22	20
Cloudy days	3	21	4	7	6	12.10
Fair days	2	2	1	2	2	1.40
Rainfall	.05	11.27	.29	1.21	4.14	3.39
Season to date	4.40	11.47	.92	1.37	4.84	4.60
Light frost	0	2	5	0	2	1.40

December, 1888—This month, for cloudy weather and the number of days it rained, has exceeded any December since 1884. The mean temperature was 50.2°, nearly 2° below the average for the past five Decembers; the maximum was 66°, 4° below the average, and the minimum 35°, an average for this month. The highest barometer was 30.28; lowest, 29.47; mean, 30.041. Number of clear days was 13; this was below the average for December. Cloudy days, 17; two above the average. Fair days, 1; three below the average. There were 12 rainy days—on the first, eighth, ninth, tenth, thirteenth, fourteenth, fifteenth, sixteenth, twenty-first, twenty-second, twenty-fourth, and twenty-sixth, a trace on the eleventh, twentieth, twenty-fourth, and twenty-ninth. Rainfall for the month, 8.91; and for the season to date, 13.75. Last season to this date, 3.99; excess this season, 9.76. There was two light frosts this month, on the thirtieth and thirty-first, thermometer at 38° and 35.5°. Prevailing winds, southerly. Number of days from south, 8; southwest, 7; west, 6; northwest, 1; northeast, 2; north, 1; east, 1. The daily weather predictions received at this station from Lieutenant Maxfield, Chief Signal Officer, San Francisco, for the month of December, have been verified in all except two instances, the fifteenth and twenty-fourth of the month. This shows over 92 per cent of the predictions verified. This we consider extraordinary and highly creditable to that officer. It must be remembered Oroville is out of the direct line of telegraph communication with that office, and not permitted to frank telegrams to the same. Our people watch my bulletin board for the daily predictions, and a short time after they are posted it is known over the city the state of the weather for the next twenty-four hours.

Summary for December, 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	53.66	53.00	52.25	51.00	50.20	52.00
Highest temperature	74.00	75.00	70.00	67.00	66.00	70.20
Lowest temperature	31.00	37.00	37.00	34.00	35.00	35.00
Clear days	12	15	15	17	13	14.20
Cloudy days	16	15	11	9	17	15.20
Fair days	3	1	5	5	1	3
Rainfall	9.33	5.53	2.75	2.60	8.91	5.83
Season to date	13.73	16.00	3.67	3.99	13.75	10.23
Light frost	2	0	4	7	2	3

The following annual summary for the years 1884, 1885, 1886, 1887, and 1888, is for Oroville:

It will be seen the average annual mean temperature for the five years was 64.15°; the highest was in 1885, 67.25°; lowest, in 1888, 60.15°. The annual maximum was highest in 1887, 87.4°; average, 84.43°; lowest in 1885, 82.60°. Minimum, the average was 45.16°; highest in 1885, 48.3°; lowest in 1887, 42.2°. The average number of clear days for the four years (leaving out 1884, as the record was but four months) was 266 days; the highest number in any one year was 287 in 1887, and the lowest was 236 in 1885. The average for cloudy days was 67; the highest in any one year was 91 in 1885, and the least, 48 in 1887. The average number of rainy days in the four years was 54, and 61 was the highest number in 1888, and 47 the lowest in 1887. The average annual rainfall for the four years was 21.54 in 1888, and the least was 17.88 in 1886. The average number of light frosts for the five years was 12.3, and of killing frosts, 6.3; the most light frost was 22 in 1887, and of killing, 13 in January, 1888.

Annual Summary for 1884 to 1888, at Oroville.

Year:	1884.	1885.	1886.	1887.	1888.	Average.
Mean temperature	64.60	67.25	64.28	64.53	60.10	64.15
Highest temperature	84.65	82.06	83.34	87.04	85.09	84.43
Lowest temperature	44.61	48.03	46.12	42.02	45.00	45.16
Clear days	*110	236	274	287	266	266
Cloudy days	*33	91	63	48	66	67
Fair days	*10	38	28	20	35	32
Rainfall	13.73	22.76	17.88	17.99	27.52	21.54
Light frost	16	4	13	22	8	12

*Four months record.

Chico Temperature and Rainfall.

The following table shows the average temperature and rainfall by seasons, as deduced from fourteen years' observations, along with the highest and lowest temperatures:

	Seasonal Temperature—Degrees.	Seasonal Rainfall—Inches and Tenths.
Average winter	47.3	11.52
Average spring	62.4	4.88
Average summer	81.3	.36
Average autumn	64.1	3.56
Average yearly	63.8	20.32
Highest temperature	108.0	
Lowest temperature	18.0	

Average monthly rainfall, as deduced from fourteen years of observation, at Chico:

Months.	Inches.	Months.	Inches.
January	4.23	August	.03
February	3.74	September	.26
March	2.94	October	1.11
April	1.58	November	2.19
May	.80	December	3.55
June	.30		
July	.04	Seasonal	20.32

Average monthly temperature, as deduced from fourteen years of observation at Chico:

Months.	Degrees.	Months.	Degrees.
January	44.0	August	81.9
February	49.8	September	75.3
March	56.5	October	64.8
April	61.9	November	52.3
May	68.7	December	46.1
June	78.0		
July	83.2	Year	63.5

Lowest temperature, 18°, in January, 1888, during the passage of the cold wave.

Rainfall at Oroville, Butte County.

The rainfall for Oroville was furnished by Mr. Hiram Arents, Signal Service Observer at that place, from September, 1884, to date:

Year:	1884.	1885.	1886.	1887.	1888.	1889.
January	.....	2.10	6.13	1.02	7.72	.16
February	.....	.73	.36	8.93	.99	.57
March	.....	.25	2.70	.98	3.44	8.98
April	.....	1.64	5.48	2.81	.14	.....
May	.....	.65	.50	.08	.38	.....
June	.....	.39	none	.18	1.16	.....
July	.....	sprin.	sprin.	sprin.	.07	.....
August	.....	none	sprin.	.01	none	.....
September	2.27	.20	none	.15	.63	.....
October	2.08	sprin.	.63	none	none	.....
November	.05	11.27	.29	1.21	4.14	.....
December	9.33	5.53	2.75	2.62	8.91	.....
Total for year	*13.73	22.76	18.84	17.99	27.52	.....
Season of	.....	1884–85	1885–86	1886–87	1887–88	1888–89
Total for season	.....	19.49	32.17	17.67	17.82	*19.46

*Up to April, 1889.

Annual Meteorological Review, for Red Bluff, Tehama County.—The following table shows the climatic condition in all its features for eleven years, from 1877 to 1888, both years inclusive, at Red Bluff, California, furnished by John J. McLean, Observer Signal Corps:

Annual Weather Review For:	1877.*	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	------	29.58	29.64	29.65	29.65	29.64	29.67	29.62	29.65	29.65	29.64	29.97
Highest barometer	30.03	30.14	30.30	30.14	30.12	30.14	30.34	30.22	30.09	30.10	30.14	30.64
Lowest barometer	29.23	29.00	28.97	29.03	29.19	29.30	29.21	28.98	29.07	28.99	29.08	29.52
Range of barometer	------	1.14	1.32	1.11	.93	.85	1 13	1.24	1.02	1.11	1.06	1.12
Average temperature	------	64.0	63.3	61.2	62.1	60.2	61.5	60.8	64.4	63.2	64.4	64.5
Highest temperature	108.0	110.5	110.0	108.0	103.0	105.0	107.0	107.0	108.0	109.0	111.5	109.0
Lowest temperature	32.0	25.0	25.0	26.0	31.0	25.0	19.0	22.0	33.0	30.0	27.3	17.5
Range of temperature	------	85.5	85.0	82.0	72.0	80.0	88.0	85.0	75.0	79.0	84.2	91.5
Greatest monthly range of temperature	54.0	55.0	54.0	53.5	53.0	57.0	58.0	57.0	56.0	54.4	70.4	55.1
Least monthly range of temperature	34.0	25.0	36.0	27.5	32.5	30.0	39.0	35.5	32.5	34.5	35.9	25.6
Average maximum temperature	------	86.9	89.2	86.7	86.0	83.7	87.2	72.0	75.3	76.2	75.6	75.1
Average minimum temperature	------	41.4	41.3	39.8	41.1	39.5	39.8	49.7	52.8	52.4	51.4	52.2
Average range of temperature	------	45.5	47.8	47.0	45.1	43.9	47.3	44.0	44.8	46.6	50.0	46.2
Average humidity	------	53.2	52.5	51.4	55.1	58.0	55.1	59.3	57.5	55.3	47.0	52.5
Average dew point	------	------	------	------	------	------	41.5	43.5	45.2	42.8	39.5	41.7
Prevailing direction of wind	N.	N.	N.	N.	N.	N.	N.	N.&S.	S.	N.	N.	N.
Total precipitation	8.54	49.01	33.64	26.53	24.93	21.82	13.76	28.06	29.63	17.21	13.60	24.94
Total velocity of wind	28,805	70,220	*a*	*b*20,379	49,088	45,879	54,948	58,145	51,924	54,690	63,705	57,969
Maximum velocity of wind	30	46	52	60	42	40	36	48	44	50	45	45
Direction at time of maximum velocity	N.	S.E.	S.	S.E.	S.	S.	S.	S.	S.	S.E.	N. & S.	N. & S.
Total number of clear days	128	232	207	230	204	215	261	225	223	212	213	207
Total number of fair days	32	72	90	74	103	89	67	84	96	91	98	89
Total number of cloudy days	24	61	68	55	58	43	37	53	46	59	54	68
Total number of foggy days	*a*	*a*	*a*	*a*	0	0	5	0	2	2	0	1
Total number of days of precipitation	27	79	83	66	72	69	44	71	70	63	57	91
Number of earthquakes	0	2	0	0	2	0	0	1	0	0	2	0
Snow storms	*a*	*a*	*a*	*a*	*a*	0	0	1	0	1	2	4
Thunder and lightning	*a*	*a*	*a*	*a*	*a*	7	7	7	7	3	5	10
Number of solar halos	*a*	*a*	*a*	*a*	4	9	0	0	0	0	2	9
Number of lunar halos	*a*	*a*	*a*	*a*	3	2	3	5	2	14	14	10
Number of light frosts	*a*	*a*	*a*	*a*	17	19	9	21	16	14	10	16
Number of killing frosts	*a*	*a*	*a*	*a*	4	10	37	15	3	6	18	8
Number of days maximum temperature above 90°	69	93	84	71	59	60	94	53	77	89	99	88
Number of days minimum temperature below 32°	0	12	16	26	1	17	33	15	0	7	12	14

*Station opened July 1, 1877—Six months, 1877. *a* No record. *b* Five months.

Red Bluff, Tehama County.—This table is made up from the Signal Service records, and shows the total rainfall for each calendar year from 1878 to date, and the rainfall by seasons from 1877–78 to date; also the totals for each month, with the averages from the opening of the Signal Office on July 1, 1877, to date. Prepared by John J. McLean, Observer Signal Corps:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1877							.05	.03	none	1.35	3.13	3.98			
1878	20.71	16.66	4.16	2.21	.89	none	none	none	.42	1.56	1.66	.69	48.96	1877–78	53.17
1879	3.18	3.67	5.39	2.12	2.18	.30	.04	.28	sprin.	.48	6.05	9.95	33.64	1878–79	21.17
1880	2.01	1.66	1.70	7.05	1.04	none	none	none	none	.08	.14	12.85	26.53	1879–80	30.26
1881	9.40	2.79	.51	1.83	.79	.51	sprin.	none	1.07	1.61	.73	5.69	24.93	1880–81	28.90
1882	2.81	3.94	2.67	2.12	.33	.15	none	none	.49	2.80	5.07	1.44	21.82	1881–82	21.12
1883	.87	.39	2.60	1.96	2.96	none	none	none	1.04	2.68	.74	.52	13.76	1882–83	18.58
1884	3.55	2.21	7.81	4.31	.18	.97	none	none	.36	.90	.04	7.73	28.06	1883–84	24.01
1885	1.84	1.19	sprin.	.62	.64	1.37	.05	none	2.91	.10	17.05	3.90	29.67	1884–85	14.69
1886	4.80	.18	1.31	4.12	.73	sprin.	sprin.	sprin.	none	1.76	.34	3.94	17.18	1885–86	35.15
1887	.57	5.21	1.13	1.76	.77	.26	sprin.	sprin.	.06	none	1.52	2.32	13.60	1886–87	15.74
1888	4.08	2.17	3.47	.53	.51	2.61	.07	none	.33	sprin.	4.32	6.85	24.94	1887–88	17.27
1889	.51														

Meteorological Report of Observations Taken at Anderson, Shasta County, California, for 1888.

By Dr. Albert Fuch.

January—Highest barometer	29.90
Lowest barometer	29.20
Mean barometer	29.52
Highest temperature	61.0
Lowest temperature	16.0
Mean temperature	43.5
Rainfall	10.25
Prevailing direction wind	South.
February—Highest barometer	29.92
Lowest barometer	29.14
Mean barometer	29.47
Highest temperature	78.0
Lowest temperature	28.0
Mean temperature	51.40
Rainfall	3.61
Prevailing direction wind	South.
March—Highest barometer	29.88
Lowest barometer	29.04
Mean barometer	29.42
Highest temperature	77.0
Lowest temperature	30.0
Mean temperature	52.6
Rainfall	9.50
Prevailing direction wind	South.
April—Highest barometer	29.62
Lowest barometer	29.12
Mean barometer	29.38
Highest temperature	89.0
Lowest temperature	45.0
Mean temperature	63.6
Rainfall	.99
Prevailing direction wind	North.
May—Highest barometer	29.52
Lowest barometer	29.20
Mean barometer	29.32
Highest temperature	74.0
Lowest temperature	54.0
Mean temperature	69.0
Rainfall	.75
Prevailing direction wind	South.
June—Highest barometer	29.52
Lowest barometer	29.18
Mean barometer	29.37
Highest temperature	98.0
Lowest temperature	60.0
Mean temperature	68.8
Rainfall	7.27
Prevailing direction wind	South.
July—Highest barometer	29.70
Lowest barometer	29.30
Mean barometer	29.46
Highest temperature	112.0
Lowest temperature	68.0
Mean temperature	83.5
Rainfall	.28
Prevailing direction wind	North.
August—Highest barometer	29.44
Lowest barometer	29.10
Mean barometer	29.37
Highest temperature	104.0
Lowest temperature	70.0
Mean temperature	84.0
Rainfall	
Prevailing direction wind	North.
September—Highest barometer	29.60
Lowest barometer	29.19
Mean barometer	29.377
Highest temperature	105.0
Lowest temperature	58.0
Mean temperature	81.0
Rainfall	0.61
Prevailing direction wind	North.
October—Highest barometer	29.67
Lowest barometer	29.20
Mean barometer	29.43
Highest temperature	90.0
Lowest temperature	46.0
Mean temperature	63.0
Rainfall	
Prevailing direction wind	North.
November—Highest barometer	29.57
Lowest barometer	29.06
Mean barometer	29.37
Highest temperature	72.0
Lowest temperature	32.0
Mean temperature	52.9
Rainfall	6.08
Prevailing direction wind	South.
December—Highest barometer	29.66
Lowest barometer	28.78
Mean barometer	28.91
Highest temperature	68.0
Lowest temperature	35.0
Mean temperature	49.9
Rainfall	8.60
Prevailing direction wind	South.

Total rainfall, 47.74 inches. Snow in January, 3.5 inches; in February, 2.5 inches. Altitude of Anderson, 432 feet. Latitude, 40° 38′; longitude, 122° 25′.

Weather Summary for the Years 1887 and 1888, near Fort Jones, Siskiyou County.

Furnished by Isaac Titcomb, Observer.

Month.	Monthly Mean.	Monthly Mean from 5 A. M. to 7 A. M.	Monthly Mean at 2 P. M.	Monthly Mean from 5 P. M. to 7 P. M.	Highest Temperature	Lowest Temperature	Rainfall and Melted Snow—Inches and Tenths
January, 1887	35.1	28.5	41.4	35.3	58	16	5.18
February, 1887	30.3	23.1	37.6	30.1	55	10	4.96
March, 1887	43.8	33.5	56.5	41.4	67	25	1.07
April, 1887	45.2	35.4	56.0	44.3	76	26	2.63
May, 1887	54.9	42.2	68.5	53.9	96	25	0.94
June, 1887	59.5	44.9	75.4	58.2	96	35	0.36
July, 1887	67.7	50.9	85.2	66.9	98	39	0.37
August, 1887	65.3	49.6	80.7	65.6	93	37	0.18
September, 1887	60.5	46.0	75.2	60.3	87	35	0.36
October, 1887	54.3	40.6	67.7	54.7	80	30	0.09
November, 1887	42.1	33.9	50.3	42.1	72	18	1.75
December, 1887	33.6	28.2	38.6	34.0	46	21	5.88
Yearly average (for 1887)	49.4	38.1	61.1	48.9	98	10	23.77

Snowfall in January was 25 inches; snowfall in February, 66 inches; snowfall in March, inappreciable; snowfall in April, 5 inches; snowfall in May, 2 inches. Snowfall for the season, 109 inches. Rainfall for the year ending July thirty-first, 25.75 inches.

Summary for 1888.

January—This month was chiefly remarkable for its *cold term*, which commenced on the morning of the tenth and terminated on the morning of the nineteenth, with an interval of two days (eleventh and twelfth) of southerly wind. To explain: The previous month (December) was noted for frequent falls of snow and some rain, amounting to 44 inches of snow, and a total water-fall of 5.89 inches. This phase of weather continued until the third of January, giving a foot more of snow and 2.39 inches more of water-fall. It cleared off cold on the tenth, and continued below the freezing point until the nineteenth (except on the eleventh and twelfth), with a mean temperature of 12.3°, the coldest day being the twenty-four hours ending on the morning of the fifteenth, showing a mean temperature of 1.3° above zero. This period, according to reports received from various points, was probably the coldest weather that has occurred in northern California for thirty or more years. The remaining half of the month was mild, with occasional moderate rains, except the last four days, which gave a rainfall of 2.11 inches. The mean temperature of the month was 24.34°; the maximum (twenty-sixth), 52°; minimum (fourteenth), 6° below zero.

February—As January was unusually cold, so, on the other hand, February was unusally mild, and for the most part clear and pleasant, with but a few rainy days near the middle of the month. Mean temperature 46°; maximum temperature, 63° on the twenty-sixth, and the minimum, 16° on the twenty-ninth.

March—The weather was generally clear and pleasant, with but little rain or snow, but not so mild as February. Mean temperature was 38.2°; maximum, 67° on the twenty-seventh, and minimum, 14° on the ninth.

April—The weather was almost uniformly dry, clear, and pleasant, with very little rain—the first and last weeks being moderate in temperature, while the middle of the month was quite warm and spring like. Mean

temperature, 49.8°; maximum, 83° on the twentieth; minimum, 29° on the fifth.

May—This month was generally dry, clear, and pleasant in its weather aspects, with but seven moderately rainy days. The first and last parts of the month were moderate in temperature, and the middle the warmest portion of it; yet without great extremes of temperature. Mean temperature, 54.2°; maximum, 86° on the twelfth, and minimum, 35° on the twenty-first.

June—The weather was rather cold for the season, with two days of heavy rainfall in the first part of the month, and the same occurrence near the middle of the month—the latter portion being dry and pleasant, but cooler than usual on account of the prevailing winds being from the north. Mean temperature, 53.9°; maximum, 84° on the twentieth, and minimum, 36° on the twentieth.

July—It was almost uniformly dry and pleasant, with but two or three rainy days; the greater part of the month being moderate in temperature from prevalent northerly winds, with a week of pretty warm weather at the middle of the month. Mean temperature, 63.74°; maximum (twentieth), 94°; minimum (fifteenth), 43°.

August—It was clear and dry throughout, with one light thunder shower at the middle of the month. Owing to northerly winds the weather was moderate and equable, with but one or two very warm days. Mean temperature, 65.67°; maximum (twenty-ninth), 94°; minimum (first), 45°.

September—It was mainly dry and pleasant, with but seven days on which there were light thunder showers. The first half of the month was rather warmer than usual, the mean temperature being 65°; the last half was much cooler, with a mean temperature of about 59°—the mean of the whole month being 62.01°. Maximum (second), 92°; minimum (eighteenth), 40° (a light frost).

October—It was uncommonly dry, with but five days on which there were light rains. Good fall weather. Mean temperature, 50.47°; maximum (fourth), 79°; minimum (twenty-first), 32°.

November—The weather was mostly mild, with eleven moderately rainy days, and eleven fair days, the balance being cloudy and unsettled. Mean temperature, 40.62°; maximum (ninth), 57°; minimum (twenty-eighth), 23°.

December—It commenced with a week of good, pleasant weather; the middle of the month being moderately rainy and variable—the last part of it foggy or cloudy, and unsettled. The whole month was unusually mild in temperature. Mean temperature, 37.74°; maximum (twentieth), 55°; minimum (thirty-first), 26°.

The weather in 1888 was uncommonly dry in the spring months, though otherwise moderate and equable; but the unusually heavy precipitation in June sufficed to secure the well being of the farming interests; the absence of killing frosts still further tended to secure an abundant harvest, particularly of fruit. The temperature throughout the year, with the exception of the first half of January, was uncommonly uniform and equable, much nearer to the annual average than usual, though on this account less favorable to produce a water supply for the mining interest, which was comparatively a failure. Mean yearly temperature, 48.9°; highest, 94° on July twentieth, and lowest, 6° below zero on January fourteenth.

Scott Valley, Siskiyou County.—The rainfall for Scott Valley, Siskiyou County, was tabulated from the observations taken by Mr. Isaac Titcomb, of Walla Walla Creek, eight miles northwest of Fort Jones, beginning with August, 1859, being continuous to date:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1859								.50	.87	1.00	4.33	.75		1859–60	18.66
1860	2.59	1.25	4.12	.75	2.00	.40	1.62	.24	.49	2.22	2.00	5.74	23.52	1860–61	22.27
1861	1.12	2.50	2.50	3.00	.54	.30	none	none	none	.51	11.56	10.63	32.66	1861–62	40.86
1862	9.29	3.75	1.32	2.00	1.00	.80	.10	none	.02	.15	.12	1.90	20.45	1862–63	15.57
1863	4.75	1.75	2.45	2.00	.40	1.93	.25	.09	.40	.25	1.85	6.17	22.29	1863–64	15.85
1864	2.07	.43	.82	2.70	.51	.31	none	.03	.04	.31	6.00	12.75	26.57	1864–65	25.82
1865	1.87	2.40	1.30	.32	.05	.75	.35	.02	1.15	1.33	9.79	1.21	20.54	1865–66	35.50
1866	6.59	3.50	9.20	.02	1.72	.62	.50	.47	none	.08	2.51	11.75	36.96	1866–67	28.88
1867	9.12	2.02	.64	1.34	.44	.01	none	.26	.40	.88	1.75	9.68	26.54	1867–68	23.61
1868	3.06	1.50	3.70	1.14	.18	1.06	none	none	.06	.50	.77	2.80	14.77	1868–69	18.16
1869	5.76	1.13	1.32	3.61	1.52	.69	.13	none	1.00	.01	3.04	3.56	21.77	1869–70	20.00
1870	5.00	2.91	1.73	1.37	1.12	.13	none	none	.01	.02	1.00	3.50	16.79	1870–71	13.56
1871	1.86	2.47	1.62	2.27	.55	.26	.35	none	.37	.05	1.62	7.68	19.10	1871–72	23.21
1872	4.18	6.94	1.40	.34	.25	.03	.01	.01	.41	.16	2.67	3.38	19.78	1872–73	13.82
1873	1.33	3.00	1.05	1.50	.27	.03	.03	.05	.37	.94	1.71	4.49	14.77	1873–74	21.81
1874	6.38	1.80	3.65	1.55	.71	.13	.01	.09	none	1.55	4.33	.43	20.63	1874–75	12.72
1875	3.13	.17	1.79	.35	.75	.12	.38	.05	none	4.45	7.31	7.33	25.83	1875–76	31.13
1876	2.26	3.33	3.94	.71	1.19	.18	.34	1.00	1.02	3.75	.54	.01	18.27	1876–77	19.12
1877	1.71	4.23	3.10	1.23	1.48	.71	.12	.02	.01	.45	.67	1.62	15.35	1877–78	23.47
1878	9.72	6.53	3.74	.27	.20	.12	.01	.06	.36	2.81	2.16	1.14	27.12	1878–79	26.05
1879	3.25	3.54	8.39	2.66	1.40	.27	.38	.47	.11	.81	4.64	4.58	30.50	1879–80	33.31
1880	10.62	2.32	2.65	5.39	1.32	.02	.37	.07	none	.18	.32	6.76	30.02	1880–81	31.37
1881	13.95	6.53	.79	1.19	.17	1.04	.54	.04	.76	3.53	2.40	4.60	35.54	1881–82	28.08
1882	4.48	5.69	2.22	2.45	1.29	.08	2.49	none	1.44	2.86	2.72	3.75	29.47	1882–83	24.36
1883	2.58	1.51	1.11	3.25	2.65	none	.40	.63	.66	2.41	1.11	4.75	21.06	1883–84	26.41
1884	4.28	3.14	3.45	3.06	1.65	.87	1.62	.01	.60	1.04	.16	8.18	28.06	1884–85	22.49
1885	2.50	3.49	.11	1.98	1.40	1.40	1.16	.01	.83	.53	10.24	3.26	26.91	1885–86	30.92
1886	7.22	1.32	1.32	3.23	1.77	.03	2.13	.85	none	1.85	.78	6.67	27.17	1886–87	27.40
1887	5.18	4.96	1.07	2.63	.94	.36	.37	.18	.36	.09	1.75	5.88	23.77	1887–88	25.20
1888	6.18	1.77	2.43	.18	1.80	4.21	.60	.11	.58	.40	1.94	1.59	21.79	1888–89	*7.33
1889	1.86	.25													

* Up to March 1, 1889.

Table Showing the Average and Highest and Lowest Temperature and Rainfall for the Sacramento Valley Counties.

Stations and Counties.	Elevation—Feet	Average Winter Temperature	Average Spring Temperature	Average Summer Temperature	Average Autumn Temperature	Average Annual Temperature	Highest Temperature	Lowest Temperature	Average Seasonal Rainfall—Inches
Shasta County:									
Redding	565	47.8	61.1	81.0	65.3	63.8	110	18	36.66
Anderson	432	50.0	59.3	80.7	60.2	62.6	114	20	39.97
Tehama County:									
Tehama	220	47.7	61.9	81.3	64.1	63.8	115	21	15.39
Red Bluff	307	46.8	59.8	79.7	63.2	62.4	110	16	27.46
Butte County:									
Chico	193	47.3	62.4	81.3	64.2	63.8	110	18	20.84
Oroville	171	52.0	64.5	78.8	64.3	64.9	102	20	22.11
Colusa County:									
Princeton	67	48.2	61.4	78.7	63.3	62.8	114	20	15.25
Williams	89	47.4	61.6	79.7	63.9	63.2	114	19	12.09
Willows	132	45.8	63.1	81.3	63.4	63.4	112	19	12.03
Orland	254	51.9	65.1	82.9	67.9	66.9	113	22	16.36
College City		48.4	63.3	76.6	60.9	62.3	114	20	16.35
Sutter County:									
Nicolaus	40	50.9	57.7	77.7	61.7	62.0	111	18	19.57
Yuba County:									
Marysville	69	50.1	62.7	78.3	65.6	64.2	108	18	16.60
Placer County:									
Rocklin	249	46.9	61.4	78.3	63.0	62.4	114	19	19.45
Auburn	1,363	46.2	56.4	74.3	61.7	59.7	106	13	33.15
Colfax	2,421	46.0	55.9	76.0	60.2	59.5	106	16	45.16
El Dorado County:									
Georgetown	2,750	50.0	59.0	85.0	67.0	64.0	102	11	60.04
Amador County:									
Ione	287	49.1	60.5	78.0	64.6	64.0	110	19	20.06
Sacramento County:									
Sacramento	35	48.3	59.5	71.6	61.6	60.2	106	19	19.80
Galt	49	48.5	61.7	76.4	62.6	62.3	108	19	15.70
Brighton	53	47.4	59.9	74.8	61.9	61.2	109	19	16.44
Yolo County:									
Knight's Landing	35	48.0	60.6	75.9	63.0	61.9	110	20	16.77
Woodland	45	48.3	61.6	77.7	63.8	62.8	106	18	16.59
Davisville	51	49.7	62.4	77.0	65.7	63.7	118	19	15.95
Dunnigan	65	47.8	63.6	79.9	65.4	64.2	118	20	16.48
Solano County:									
Fairfield or Suisun	12	49.7	61.4	73.1	65.2	62.4	110	18	20.10
South Vallejo	23	50.0	59.5	66.8	61.4	59.4	105	24	14.32
Benicia	64	46.6	56.8	67.6	60.7	57.9	105	26	15.97

Monthly Weather Report for 1888 of Eureka, Humboldt County.

Prepared by Maurice Connell, Observer Signal Corps.

Month.	Mean Temperature	Maximum Temperature	Minimum Temperature	Days Below 32°	Mean Relative Humidity	Prevailing Wind	Maximum Wind Velocity	Clear Days	Fair Days	Cloudy Days	Days of Precipitation	Total Precipitation
January	44.6	77	20	11	84.5	S.E.	36	7	9	15	19	12.95
February	48.1	65	31	1	84.8	N.	36	6	13	10	10	1.98
March	47.7	68	32	------	79.1	N.	36	9	8	14	13	4.09
April	50.9	68	39	------	80.9	N.	33	6	15	9	10	1.05
May	53.0	71	44	------	85.1	N.	36	4	12	16	7	0.76
June	58.8	71	47	------	84.9	N.	34	2	13	15	15	4.66
July	56.6	73	48	------	88.0	N.	36	14	8	9	2	0.44
August	56.0	68	49	------	91.4	N.	24	9	8	14	0	trace
September	56.5	73	46	------	90.2	N.	36	14	7	9	3	0.06
October	53.0	67	40	------	91.0	N.	38	12	13	6	9	1.15
November	50.2	70	35	------	86.8	N.	34	8	7	15	14	3.41
December	53.0	66	38	------	83.8	S.E.	34	2	5	24	17	5.93
Totals	------	------	------	12	------	------	------	93	117	156	119	36.48
Means	52.4	77 in Jan.	20 in Jan.	------	85.9	N.	36	------	------	------	------	------

One thunder storm during the year.

Yearly Weather Summary at Hydesville, California.

By E. T. Foss, Observer.

Average rainfall from January to December ..... 37.21 inches.
Greatest rainfall from January to December was in 1885 ..... 41.59 inches.
Least rainfall from January to December was in 1888 ..... 30.89 inches.
Average rainfall from July to June ..... 37.28 inches.
Greatest rainfall from July to June was in 1886 ..... 55.70 inches.
Least rainfall from July to June was in 1885 ..... 26.91 inches.
Average rainfall from September to May ..... 36.88 inches.
Greatest rainfall from September to May was in 1886 ..... 55.70 inches.
Least rainfall from September to May was in 1885 ..... 25.84 inches.

Temperature and Rainfall at Wheatland.

The following monthly record of temperature and rainfall at Wheatland, Yuba County, was compiled and forwarded by Mr. William Lumbard, and shows the highest, lowest, mean temperature, and total rainfall for each month, and for the year 1887:

Month.	Highest Temperature.	Lowest Temperature.	Mean Temperature.	Rainfall, in Inches.
January	74	30	47.3	0.94
February	68	31	44.1	5.37
March	79	40	54.2	1.33
April	84	41	58.8	2.15
May	106	41	66.8	0.10
June	110	52	73.2	0.57
July	106	55	77.2	.00
August	101	52	74.1	.00
September	103	51	72.8	0.06
October	95	42	67.0	.00
November	78	29	54.7	0.50
December	62	30	45.4	2.01
Sums	1,066	494	73.56	13.03
Means	8.88	41.1	61.3	

Meteorological Report of Napa City.

By W. H. Martin, Druggist.

Showing average temperature and average maximum and minimum temperature, highest and lowest temperature, and total precipitation from July, 1877, to date:

Year.	July.				August.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1877	67.8	79.9	55.7	.11	64.2	76.2	52.2	
1878	64.5	77.0	52.0		64.5	75.8	53.2	.01
1879	64.0	75.1	52.9		64.9	77.0	52.8	
1880	63.4	74.2	52.6		62.2	74.9	49.5	
1881	65.9	78.4	53.5		63.0	75.4	50.6	
1882	63.8	75.3	52.3		62.4	73.7	51.1	
1883	63.4	74.7	52.1		63.4	76.2	50.6	
1884	65.9	80.0	51.9		62.8	76.2	49.4	
1885	64.2	73.3	55.1		61.9	70.2	53.6	
1886	66.0	76.9	55.1		65.5	77.0	54.0	
1887	61.0	71.7	50.3		60.6	70.4	50.8	
1888	65.1	76.1	54.1	.03	65.9	77.3	54.5	
Averages	64.3	76.0	53.4	.01	64.6	76.0	53.0	

METEOROLOGICAL REPORT OF NAPA CITY—Continued.

YEAR.	SEPTEMBER.				OCTOBER.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1877	65.5	79.0	52.0	.....	58.0	69.3	46.7	.69
1878	61.5	74.3	48.9	1.50	58.8	70.0	47.7	2.54
1879	63.3	77.0	49.7	.....	60.7	74.8	46.6	.83
1880	61.5	74.4	48.6	.....	56.1	65.9	46.3	.....
1881	61.6	74.2	49.1	.26	53.9	64.1	43.7	.47
1882	63.7	73.5	54.0	.48	49.9	55.0	44.8	2.93
1883	64.2	76.1	52.4	1.10	55.6	63.6	47.7	1.69
1884	58.0	70.3	45.7	.21	54.4	64.6	44.2	1.62
1885	62.9	72.9	52.9	.07	58.6	68.1	49.2	.62
1886	62.0	73.0	51.0	.....	54.7	63.7	45.7	.89
1887	62.5	73.8	51.2	.22	61.2	72.8	49.6	.....
1888	65.1	75.6	54.6	1.08	59.3	70.0	48.7	.....
Averages	63.8	75.0	52.6	.41	57.9	68.2	47.6	1.02

YEAR.	NOVEMBER.				DECEMBER.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1877	52.6	61.1	44.2	1.82	46.8	55.0	38.6	1.86
1878	51.4	60.8	42.1	.95	45.0	55.0	35.0	1.15
1879	50.5	59.7	41.3	3.95	42.8	49.9	35.8	7.26
1880	48.9	59.8	38.1	.08	47.7	52.1	43.3	11.36
1881	49.1	59.3	39.0	1.59	44.3	51.1	37.6	4.31
1882	46.9	55.0	38.8	4.02	45.6	54.3	37.0	3.55
1883	47.2	56.5	38.0	.73	41.1	49.8	32.4	.63
1884	51.7	60.4	43.0	.....	47.9	55.9	39.9	10.32
1885	52.3	58.0	46.6	9.37	48.4	54.2	42.6	4.21
1886	47.5	57.1	37.9	.22	47.5	53.4	41.6	2.96
1887	50.8	60.8	40.8	1.55	45.1	52.5	37.8	3.71
1888	50.7	57.9	43.6	3.12	47.3	52.4	42.3	5.18
Averages	50.3	58.4	42.3	2.28	46.4	52.7	40.2	4.71

YEAR.	JANUARY.				FEBRUARY.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1878	48.1	54.6	41.6	15.31	48.2	55.1	42.3	13.82
1879	44.2	53.9	34.5	5.10	50.9	59.0	42.8	5.77
1880	42.0	50.3	33.8	3.64	46.0	53.8	38.2	2.19
1881	49.4	54.4	43.4	12.72	52.8	58.2	47.5	3.15
1882	43.0	50.6	35.4	3.22	43.2	50.8	35.6	3.65
1883	39.7	47.1	32.3	.92	42.8	50.6	35.0	1.00
1884	43.2	54.0	32.4	3.67	51.8	62.3	41.4	5.22
1885	43.4	49.2	37.7	1.77	50.6	57.8	43.4	.61
1886	44.7	49.6	39.8	7.86	51.1	59.1	43.1	.25
1887	45.1	53.0	37.2	1.70	41.0	48.0	34.0	10.62
1888	41.4	46.5	36.3	4.15	48.9	56.6	41.3	1.28
Averages	44.0	51.2	36.8	5.46	47.9	55.5	40.4	4.32

METEOROLOGICAL REPORT OF NAPA CITY—Continued.

YEAR.	MARCH.				APRIL.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1878	53.1	61.0	45.2	4.97	54.5	64.9	44.1	1.50
1879	54.0	64.1	46.6	9.40	56.6	65.5	47.8	2.38
1880	47.9	57.2	38.5	2 61	52.0	58.7	45.3	12.25
1881	51.4	60.6	42.3	1.35	56.5	65.0	48.0	1.59
1882	49.0	58.0	40.0	3.60	57.0	63.3	40.7	1.74
1883	50.9	58.4	43.4	5.53	51.8	61.3	42.3	1.85
1884	50.0	58.1	41.9	7.12	52.5	61.8	43.2	5.68
1885	54.0	62.4	45.6	.49	57.9	66.3	49.5	1.66
1886	48.8	57.8	39.8	1.22	52.5	59.6	45.4	3.82
1887	51.9	61.2	42.7	.48	54.6	64.3	44.9	2.03
1888	49.5	57.6	41.4	4.34	57.8	69.1	46.5	.47
Averages	51.0	59.6	42.4	3.74	54.8	63.6	45.2	3.18

YEAR.	MAY.				JUNE.			
	Mean.	Average Max.	Average Min.	Rain for Month.	Mean.	Average Max.	Average Min.	Rain for Month.
1878	59.8	70.6	49.0	.40	64.0	75.1	52.9	
1879	56.9	65.8	48.1	1.53	64.8	76.8	52.8	0.5
1880	59.1	69.2	49.0	1.39	61.8	73.7	49.9	
1881	60.1	72.7	47.6	.11	61.3	73.3	49.3	.72
1882	59.0	71.3	46.7	.15	60.6	71.0	50.2	
1883	57.7	69.6	45.7	5.25	67.2	79.1	55.3	
1884	59.1	70.1	48.1	.35	60.6	69.6	51.6	2.72
1885	58.7	69.6	49.9	.05	60.6	69.1	52.1	.04
1886	58.0	68.0	48.0	.32	63.7	74.9	52.5	
1887	57.6	67.6	47.6	.05	63.1	74.7	51.5	
1888	57.2	65.8	48.6	.94	63.5	73.9	53.1	.42
Averages	58.5	69.1	48.0	.96	62.8	73.7	51.9	.36

The following yearly mean temperature and rainfall is for the year beginning with July and ending with June, and not for the twelve calendar months, and furnished by W. H. Martin, druggist, of Napa:

YEAR.	AVERAGE.			RAIN.
	Yearly Mean.	Yearly Max.	Yearly Min.	Fall for Year.
1877-78	56.9	66.8	47.6	40.48
1878-79	56.0	66.5	45.9	30.38
1879-80	54.6	64.7	44.4	34.12
1880-81	55.9	65.5	46.4	31.08
1881-82	53.7	63.9	43.5	18.99
1882-83	53.5	62.7	44.3	25.53
1883-84	54.3	64.4	44.3	28.91
1884-85	55.5	65.1	46.0	16.77
1885-86	55.5	63.8	47.3	27.74
1886-87	54.6	64.1	45.2	18.95
1887-88	54.9	64.2	45.6	17.08
Averages for eleven years	55.0	64.6	45.4	26.36

Napa Weather for 1888.

Month.	Highest Temperature	Lowest Temperature	Mean Daily Range	Prevailing Direction of Wind	Clear Days	Fair Days	Cloudy Days
January	57	23	10.2	N.	2	12	17
February	73	34	15.3	S.	16	11	2
March	70	33	16.3	S.	16	11	5
April	79	37	22.5	S.	19	11	0
May	79	41	17.2	S.W.	9	21	1
June	84	46	20.8	S.	16	10	4
July	91	46	22.0	S.	19	11	1
August	90	51	22.7	S.	20	11	0
September	90	49	21.1	S.	18	9	3
October	81	42	21.2	S.	16	15	0
November	70	34	14.3	S.	12	8	10
December	59	35	10.1	N.	6	16	9

Average temperature, highest and lowest temperature, rainfall, clear days, etc., for January, February, and March, 1889, by W. H. Martin, druggist, Napa City:

Month.	Mean Temperature	Mean Max. Temperature	Mean Min. Temperature	Max. Temperature	Min. Temperature	Mean Range of Temperature	Total Precipitation—In.	Prev. Winds	Clear Days	Fair Days	Cloudy Days
January	41.6	48.9	34.3	56	30	14.5	1.02	N.	21	6	4
February	46.4	55.3	37.4	66	27	17.8	.76	N.&S.	13	13	2
March	53.2	60.8	45.5	74	38	15.3	8.38	N.&S.	9	12	10

Rainy days for each month in the year, along with the yearly totals and the monthly and yearly averages, from November, 1876, to date, by W. H. Martin, druggist, Napa City:

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Total for Year
1876											1	0	
1877	11	7	6	6	3	1	2	0	0	4	9	7	56
1878	18	21	12	5	2	0	0	1	3	3	2	5	72
1879	10	9	15	8	7	1	0	0	0	2	9	14	75
1880	7	9	8	17	3	0	0	0	0	0	1	18	63
1881	9	9	5	6	2	2	0	0	2	3	3	13	54
1882	9	10	11	7	1	1	0	0	2	6	7	6	60
1883	2	5	4	4	8	1	0	0	2	6	3	5	40
1884	9	10	16	11	4	7	0	1	2	3	0	11	74
1885	7	2	3	5	1	1	1	0	2	1	18	8	49
1886	9	1	8	11	2	0	0	0	0	6	2	7	46
1887	7	16	4	8	1	1	1	0	1	0	4	10	53
1888	14	6	7	1	3	5	1	0	2	0	10	15	64
1889	4	4	14										
Monthly averages	8.9	8.3	8.7	7.4	3	1.4	0.4	0.2	1.3	2.8	5.3	9.1	58.4

Daily Normal Temperature at San Francisco.

The following table of normal temperatures for each day of each month, at San Francisco, as deduced from three daily observations for fifteen years, was furnished by Nelson Gorom, Observer in charge of the San Francisco local Signal Office:

Date.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	50.3	52.2	54.4	55.1	56.4	57.9	58.5	59.1	59.8	59.4	57.3	54.7
2	50.7	52.7	54.6	54.7	56.8	57.7	58.4	59.2	60.6	59.2	56.0	53.1
3	50.0	52.4	54.0	54.4	55.6	58.0	58.3	58.3	60.0	60.2	55.9	52.7
4	50.3	52.3	52.7	54.6	55.6	58.9	58.9	58.6	59.9	58.9	57.1	53.6
5	52.3	51.0	54.0	53.5	55.5	60.2	58.4	58.8	59.0	59.0	57.0	54.0
6	51.0	50.6	53.4	53.1	56.0	60.0	58.0	58.9	58.3	59.9	57.7	53.2
7	51.7	50.6	52.9	53.9	57.1	58.7	58.4	58.3	58.6	61.1	58.3	52.6
8	51.3	51.4	52.7	54.9	56.2	58.9	59.0	58.4	58.7	60.5	57.8	51.4
9	50.5	51.5	52.9	54.6	55.3	58.9	58.9	58.6	58.9	59.2	57.7	50.8
10	50.3	51.1	53.1	53.9	55.4	59.1	58.8	58.7	59.8	59.9	56.1	50.9
11	49.3	50.7	53.7	54.0	55.4	60.0	58.9	57.9	60.3	60.0	56.1	50.5
12	48.5	51.0	53.6	53.8	54.7	60.0	59.4	57.8	60.4	58.9	55.4	50.3
13	49.2	51.6	52.5	53.1	54.7	58.7	58.9	58.1	60.7	57.3	55.4	51.0
14	50.7	51.1	52.7	54.3	54.8	57.4	58.7	58.5	61.0	57.9	56.3	51.7
15	50.2	51.8	52.9	54.7	55.1	57.7	58.8	58.2	60.0	58.9	55.9	51.6
16	51.0	52.0	52.6	53.8	55.7	57.8	58.7	57.6	59.9	59.5	56.0	51.0
17	50.4	51.7	52.8	53.9	55.6	57.9	58.2	58.2	59.6	61.4	55.5	50.2
18	50.3	50.9	54.5	53.6	56.5	58.6	57.6	58.5	58.9	61.3	54.8	51.2
19	51.2	51.6	54.2	54.0	56.7	59.2	57.6	57.8	59.7	59.9	54.1	52.3
20	49.9	53.0	54.1	53.9	56.1	59.6	57.8	57.3	60.8	58.9	55.1	52.3
21	50.0	53.6	53.9	55.2	56.4	57.7	57.6	57.9	61.7	59.4	55.7	51.9
22	51.3	53.8	54.6	55.8	56.3	58.2	57.7	58.1	60.3	59.2	56.1	51.9
23	51.1	53.8	54.0	56.5	57.3	58.1	57.7	58.2	59.8	58.8	55.7	52.4
24	50.8	52.4	54.6	56.1	58.0	56.9	57.9	59.2	59.6	58.2	55.0	53.3
25	50.9	52.7	54.5	54.4	58.7	57.2	57.9	58.8	61.2	58.5	53.5	52.7
26	50.3	53.3	55.5	54.4	58.0	58.6	58.8	59.2	58.8	59.7	53.4	51.5
27	50.5	52.9	55.6	54.9	57.9	57.0	58.7	59.6	59.0	58.8	54.2	51.5
28	50.6	52.6	54.5	55.8	57.1	57.6	58.6	59.1	60.0	58.0	54.4	51.5
29	51.5	51.5	54.7	55.2	57.4	58.2	58.8	59.6	59.9	57.7	55.6	50.1
30	51.4	------	53.9	55.7	58.5	58.1	58.6	60.5	58.9	57.2	55.0	49.9
31	51.5	------	54.6	------	58.7	------	59.5	59.3	------	57.6	------	49.7
Monthly	50.6	52.0	53.8	54.5	56.4	58.4	58.5	58.6	59.8	59.2	55.8	51.8

Monthly Weather Report of San Francisco for 1888.

Prepared by Nelson Gorom, Observer Signal Corps.

Month.	Mean Temperature	Maximum Temperature	Minimum Temperature	Number of Days above 90°	Number of Days below 32°	Mean Monthly Relative Humidity	Prevailing Wind	Maximum Wind Velocity	Clear Days	Fair Days	Cloudy Days	Days of Precipitation	Number of Foggy Days	Total Precipitation
January	46.3	62.8	28.7	0	3	76.0	S.E.	40	8	7	16	16	0	6.81
February	52.8	76.3	41.9	0	0	76.2	W.	25	12	11	6	5	0	0.94
March	52.5	73.7	38.0	0	0	72.9	W.	36	13	9	9	11	0	3.60
April	56.2	87.7	46.0	0	0	73.9	W.	36	13	13	4	2	0	0.11
May	55.4	81.1	47.4	0	0	77.7	W.	29	5	14	12	5	0	0.38
June	61.0	79.9	53.2	0	0	76.6	W.	35	12	10	8	8	0	0.27
July	59.1	93.4	51.0	1	0	78.7	S.W.	35	9	18	4	1	0	0.01
August	57.8	85.1	50.8	0	0	83.2	S.W.	34	13	16	2	0	0	0.01
September	59.0	87.7	50.1	0	0	83.5	W.	34	10	16	4	2	0	0.98
October	58.6	86.7	49.5	0	0	78.2	W.	32	14	14	3	2	2	0.13
November	55.1	74.3	47.0	0	0	80.1	W.	26	8	12	10	7	0	3.99
December	52.4	64.7	43.1	0	0	85.2	N.W.	25	0	15	16	17	0	5.80
Sums	666.2	953.5	546.7	1	3	942.2	------	------	117	155	94	76	2	23.03
Means	55.5	79.5	45.6	0.1	0.2	78.5	W.	------	------	------	----	----	----	------

Rainfall at San Francisco.—The rainfall from 1849 to 1875, in the following table, was taken from the report of the State Agricultural Society for 1874, and was furnished to that society by Thomas Tennent. The rainfall from 1875 to date is compiled from the reports of the Signal Office:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1849	------	------	------	------	------	------	none	none	none	3.14	8.66	6.20	------	------	------
1850	8.34	1.77	4.53	.46	none	none	none	none	.33	none	.92	1.05	17.40	1849–50	33.10
1851	.72	.54	1.94	1.23	.67	none	none	none	1.03	.21	2.12	7.10	15.56	1850–51	7.40
1852	.58	.14	6.68	.26	.32	none	none	none	none	.80	5.31	13.20	27.29	1851–52	18.44
1853	3.92	1.42	4.86	5.37	.35	none	none	.04	.46	.12	2.28	2.32	21.14	1852–53	35.23
1854	3.88	8.04	3.51	3.12	.02	.08	none	.01	.15	2.41	.34	.81	22.37	1853–54	23.87
1855	3.67	4.77	4.64	5.00	1.88	none	none	none	none	none	.67	5.76	26.39	1854–55	23.68
1856	9.40	.50	1.60	2.94	.76	.03	.02	none	.07	.45	2.79	3.75	22.31	1855–56	21.66
1857	2.45	8.59	1.62	none	.02	.12	none	.05	none	.93	3.01	4.14	20.93	1856–57	19.88
1858	4.36	1.83	5.55	1.55	.34	.05	.05	.16	none	2.74	.69	6.14	23.46	1857–58	21.81
1859	1.28	6.32	3.02	.27	1.55	none	none	.02	.03	.05	7.28	1.57	21.39	1858–59	22.22
1860	1.64	1.60	3.99	3.14	2.86	.09	.21	none	none	.19	.58	6.16	20.46	1859–60	22.27
1861	2.47	3.72	4.08	.51	1.00	.08	none	none	.02	none	4.10	9.54	25.52	1860–61	19.00
1862	24.36	7.53	2.20	.73	.74	.05	none	none	none	.40	.15	2.35	38.51	1861–62	49.27
1863	3.63	3.19	2.06	1.04	.26	none	none	none	.03	none	2.55	1.80	14.56	1862–63	13.08
1864	1.83	none	1.52	1.57	.78	none	none	.21	.01	.13	6.68	8.91	21.64	1863–64	10.08
1865	5.14	1.34	.74	.94	.63	none	none	none	.24	.26	4.19	.58	14.06	1864–65	24.73
1866	10.88	2.12	3.04	.12	1.46	.04	none	none	.11	none	3.35	15.16	36.28	1865–66	22.93
1867	5.16	7.20	1.58	2.36	none	none	none	none	.04	.20	3.41	10.69	30.64	1866–67	34.92
1868	9.50	6.13	6.30	2.31	.03	.23	none	none	none	.15	1.18	4.34	30.17	1867–68	38.84
1869	6.35	3.90	3.14	2.19	.08	.02	none	none	.12	1.29	1.19	4.31	22.59	1868–69	21.35
1870	3.89	4.78	2.00	1.53	.20	none	none	none	.03	none	.43	3.38	16.24	1869–70	19.31
1871	3.07	3.76	1.29	1.93	.21	none	none	none	.03	.11	3.72	16.74	30.86	1870–71	14.10
1872	4.22	6.97	1.64	1.10	.16	.02	none	none	.14	.21	2.62	7.25	24.33	1871–72	34.71
1873	2.17	4.24	.78	.52	.01	.08	.03	.15	none	.68	1.31	10.12	20.09	1872–73	18.02
1874	4.85	1.83	3.55	1.04	.34	.08	none	none	.83	2.73	5.92	.28	21.46	1873–74	23.98
1875	6.97	.20	1.08	.02	.11	1.01	none	none	none	.24	7.27	4.15	21.05	1874–75	19.15
1876	7.55	4.92	5.49	1.29	.24	.04	.01	.01	.38	3.36	.25	none	23.54	1875–76	31.19
1877	4.32	1.18	1.08	.20	.18	.91	.02	none	none	.65	1.57	2.66	11.93	1876–77	11.04
1878	11.97	12.52	4.56	1.06	.16	.01	.01	none	.55	1.27	.57	.58	33.26	1877–78	35.18
1879	3.52	4.90	8.75	1.89	2.35	.05	.01	.02	sprin.	.78	4.03	4.46	30.76	1878–79	24.44
1880	2.23	1.87	2.08	10.06	1.12	none	none	none	none	.05	.33	12.33	30.07	1879–80	26.66
1881	8.69	4.64	.90	2.00	.22	.69	none	none	.25	.54	1.94	3.85	23.72	1880–81	29.85
1882	1.68	2.96	3.45	1.22	.21	.04	none	none	.26	2.66	4.18	2.01	18.67	1881–82	16.14
1883	1.92	1.04	3.01	1.51	3.52	.01	none	none	.42	1.48	1.60	.92	15.43	1882–83	20.12

1884	3.94	6.65	8.24	6.33	.23	2.57	sprin.	.04	.33	2.55	.26	7.68	38.82	1883–84	32.38
1885	2.53	.30	1.01	3.17	.04	.19	.06	sprin.	.11	.72	11.78	4.99	24.90	1884–85	18.10
1886	7.42	.24	2.07	5.28	.37	.01	.23	sprin.	.01	1.48	.84	2.07	20.02	1885–86	33.05
1887	1.90	9.24	.84	2.30	.06	.07	sprin.	.01	.29	sprin.	.99	3.34	19.04	1886–87	19.04
1888	6.81	.94	3.60	.11	.38	.27	.01	.01	.98	.13	3.99	5.80	23.03	1887–88	16.74
1889	1.28	.72	7.78											1888–89	* 20.70

* Up to April 1, 1889.

San Francisco, California, Annual Meteorological Review.—Showing the climatic condition in all its features for seventeen years, from 1872 to 1888, both years inclusive; compiled by Nelson Gorom, Observer in charge of the local Signal Station:

Annual Weather Review for Year:	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Average barometer	30.039	30.029	30.020	30.026	30.007	29.994	29.976	30.035	30.047	30.044	30.060	30.054	30.001	30.028	30.041	30.038	30.016
Highest barometer	30.48	30.49	30.41	30.41	30.42	30.42	30.43	30.59	30.49	30.41	30.49	30.67	30.54	30.45	30.40	30 56	30.57
Lowest barometer	29.43	29.54	29.55	29.65	29.36	29.66	29.43	29.29	29.48	29.67	29.74	29.63	29.43	29.42	29.32	29.53	29.47
Range of barometer	1.05	0.95	0.86	0.76	1.06	0.76	1.00	1.30	1.01	0.74	0.75	0.94	1.11	1.03	1.08	1.03	1.10
Average temperature	56.2	55.9	55.7	55.7	56.3	57.3	56.6	56.1	54.2	55.8	54.4	54.7	55.7	56.9	56.1	55.2	55.5
Highest temperature	92.0	79.0	89.0	82.0	93.0	92.0	78.0	89.0	83.5	83.0	83.0	95.2	83.0	87.0	93.9	96.9	93.4
Lowest temperature	41.0	40.0	39.0	39.0	36.0	42.0	39.0	34.0	37.0	40.0	34.5	35.0	35.0	43.0	41.0	33.1	28.7
Range of temperature	51.0	39.0	50.0	43.0	57.0	50.0	39.0	55.0	46.5	43.0	48.5	60.2	48.0	44.0	52.9	63.8	64.7
Greatest range of temperature	40.0	32.0	39.0	41.0	44.0	41.0	30.0	36.0	38.5	36.0	33.0	44.2	36.0	35.0	43.8	51.3	42.4
Least range of temperature	16.0	15.0	19.0	19.0	20.0	18.0	20.0	20.0	19.0	18.0	19.0	20.0	15.5	17.5	22.7	20.9	21.6
Average maximum temperature	72.6	70.4	72.0	71.5	74.2	74.8	71.0	75.5	71.8	72.0	70.0	75.4	71.5	73.7	77.9	78.8	63.9
Average minimum temperature	47.6	47.6	46.1	46.2	46.2	48.0	47.2	46.0	44.6	46.6	44.7	45.3	47.2	49.2	45.5	44.7	50.7
Average range of temperature	25.0	22.8	25.9	25.2	28.0	26.8	23.8	29.5	27.2	25.4	25.2	30.1	24.3	24.5	32.4	34.1	13.2
Average humidity	76.1	72.5	72.3	75.6	72.0	72.2	72.9	73.9	75.6	75.8	75.0	78.1	79.5	81.0	75.1	75.4	78.5
Average dew point	------	------	------	------	------	------	------	------	------	------	------	47.5	49.1	50.7	47.5	46.8	48.2
Prevailing direction of wind	S.W.	S.W.	S.W.	S.W.	W.	W.	S.W.	W.	W.	W.	W.	W.	W.	W.	W.	W.	W.
Total precipitation	22.42	18.56	22.52	22.63	23.54	11.93	33.26	30.76	30.07	23.73	18.67	15.43	38.82	24.90	20.02	19.04	23.03
Total movement of wind	81,468	84,201	83,709	85,995	81,618	80,949	79,387	78,575	82,724	83,105	85,554	81,480	78,557	79,194	78,237	80,457	76,469
Maximum velocity of wind	36	48	32	48	44	38	40	40	44	36	36	36	45	36	42	36	40
Direction of maximum velocity	W.	S.W.	S.	N.	S.E.	N.	N.	N.E.	N.	W.	N.W.	W.	N.	W.	S.E.	W.	N.W.
Clear days	122	135	134	141	179	174	146	159	153	150	156	132	124	116	165	152	117
Fair days	138	133	149	160	125	132	142	146	110	126	144	152	148	157	134	140	155
Cloudy days	106	97	82	64	62	59	77	60	103	89	65	77	93	92	65	73	94
Days of precipitation	69	64	71	58	59	46	75	85	70	65	73	51	83	70	64	60	76
Number of earthquakes (days)	1	1	0	3	2	1	4	0	4	6	6	6	2	6	10	3	5
Snow storms	------	------	------	------	1	------	------	------	------	------	1	0	1	0	0	1	1

Thunder and lightning	2	0	4	0	1	1	1	0	0	2	4	2	3	2	1	1	9
Number of solar halos	-------	-------	-------	-------	1	11	2	2	46	66	72	76	88	67	49	46	56
Number of lunar halos	-------	-------	-------	-------	5	0	8	9	6	16	30	17	20	21	25	34	24
Number of light frosts	------	-------	-------	-------	-------	2	21	22	49	23	19	33	15	21	15	36	13
Number of killing frosts	-------	-------	-------	-------	-------	-------	-------	-------	-------	6	22	15	11	0	8	4	7
Days maximum temperature above 90°	1	0	0	0	1	2	0	0	0	0	0	3	0	0	2	1	1
Days minimum temperature below 32°	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3

Barometer readings corrected for elevation and temperature.

General Weather Review for Oakland—From 1876 to 1888, inclusive, by Dr. J. B. Trembly:

Year:	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.
Mean temperature of the year	55.09	56.29	55.28	55.11	53.69	55.62	54.49	54.66	55.85	57.71	56.36	55.14	56.77
Mean temperature, warmest day	74.00	76.00	69.33	75.33	70.66	70.00	69.33	84.66	72.66	70.00	70.33	75.66	73.60
Mean temperature, coldest day	36.00	41.63	37.00	33.66	41.00	42.00	35.00	32.33	36.00	46.00	41.00	36.66	31.33
Maximum temperature for year	97.00	96.00	84.00	93.00	89.00	87.00	84.00	103.00	88.00	89.00	91.00	101.00	91.00
Minimum temperature for year	30.00	30.00	27.00	27.00	29.00	31.00	30.00	25.00	28.00	27.00	30.00	31.00	26.00
Greatest daily variation of temperature	33.00	38.00	33 00	46.00	36.00	35.00	31.00	38.00	30.00	36.00	39.00	33.00	35.00
Least daily variation of temperature	2.00	1.00	2.00	--------	1.00	1.00	1.00	1.00	1.00	00.00	1.00	1.00	1.00
Greatest monthly range of temperature	49.00	47.00	46.00	46.00	48.00	40.00	42.00	50.00	45.00	38.80	41.00	44.00	39.00
Least monthly range of temperature	19.00	25.00	23.00	30.00	28.00	21.00	19.00	29.00	19.00	19.00	27.00	20.00	22.00
Average daily range of temperature for year	14.94	14.61	13.65	12.96	14.10	13.40	12.80	12.81	11.64	11.44	13.16	13.49	11.10
Average monthly range of temperature for year	34.92	35.50	32.50	38.00	34.91	32.00	31.16	37.58	30.00	29.16	31.66	34.50	31.00
Yearly range of temperature	67.00	66.00	57.00	66.00	60.00	56.00	54.00	65.00	60.00	52.00	61.00	70.00	65.00
Mean relative humidity for year	83.00	83.11	84.71	85.29	83.70	83.25	82.57	83.71	85.39	86.74	87.15	88.53	85.83
Highest relative humidity for year	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Lowest relative humidity for year	40.00	34.40	38.60	39.00	27.00	29.00	28.70	33.90	38.19	41.50	26.70	41.50	56.70
Greatest variation humidity in twenty-four hours	49.09	51.20	45.06	58.00	54.40	37.40	65.70	48.80	41.00	43.80	46.50	51.00	45.20
Least variation humidity in twenty-four hours	.06	.01	.02	.30	.20	.30	.40	.30	.30	.80	1.50	.00	.00
Rainfall in inches during year	21.56	11.12	31.71	28.91	28.07	26.17	18.87	15.76	38.20	22.58	22.24	16.89	22.14
Rainfall in inches in agricultural years from July 1, 1877, to July 1, 1888	28.55	12.36	32.33	23.55	23.84	31.34	18.13	20.22	31.10	17.95	32.21	18.45	17.10
Number clear and fair days during year	268	301	255	266	258	276	276	266	260	238	239	277	277
Number cloudy days during year	98	64	110	99	108	89	89	99	106	127	126	88	89
Number days in which rain fell	63	58	78	89	53	67	72	53	85	67	63	58	66
Number foggy mornings	23	8	17	19	27	28	15	21	19	20	21	18	37
Number mornings overcast	51	44	64	63	86	52	77	105	77	118	92	97	79
Number mornings frost was seen	35	35	36	46	62	47	50	58	38	27	55	49	28
Wind, direction from S.W. and W.	342	364	311	355	346	402	345	428	382	426	389	414	428
Wind, direction from N.W. and W.	210	150	173	150	136	136	150	119	128	112	112	159	96
Wind, direction from N.E. and N.	34	63	45	50	59	58	53	29	62	53	45	35	50
Wind, direction from S.E. and S.	163	150	163	126	172	138	143	91	151	142	158	129	164
Calms	340	368	402	372	385	331	404	438	375	362	391	358	350
Seasons.													
Mean temperature of spring	54.46	55.18	55.73	56.15	52.97	56.35	54.12	54.63	55.59	58.08	55.06	55.29	49.39
Mean temperature of summer	60.40	61.17	59.36	60.07	58.95	60.27	60.06	61.16	61.89	61.23	61.60	60.29	55.52

Mean temperature of autumn	57.75	57.67	56.92	56.73	55.86	54.78	56.44	54.25	57.07	59.52	56.89	56.85	62.29
Mean temperature of winter	48 20	50.39	50.12	47.60	45.38	51.10	46.80	46.20	47.38	51.69	52.12	49.80	59.30
Difference between the warmest and coldest months of spring	4.40	1.49	3.68	.70	9.91	5.12	5.77	5.60	6.16	2.04	8.05	2.39	5.07
Difference between the warmest and coldest months of summer	1.99	1.10	.35	1.26	1.88	1.55	1.13	2.78	2.60	3.25	2.00	2.03	1.49
Difference between the warmest and coldest months of autumn	6.13	7.76	5.93	9.14	7.70	8.79	9.68	10.64	3.99	5.05	8.94	7.63	6.39
Difference between the warmest and coldest months of winter	5.00	6.09	1.28	5.13	2.37	5.34	2.33	5.98	1.56	4.38	5.15	5.84	6.89
Difference between the warmest and coldest months of the year	16.20	12.25	13.06	15.68	15.78	12.38	14.77	19.26	16.38	13.33	14.43	14.87	17.71

Mean difference between the coldest and warmest months for thirteen years, 16.91°.
Mean temperature for thirteen years, 55.49°.
Mean barometer for thirteen years, 29.92.
Mean relative humidity for thirteen years, 84.54.
Mean annual rainfall for thirteen years, 23.66 inches.

Monthly Rainfall in Oakland for the Years 1873-1888.—By Mr. James Hutchison, of the Bay Nursery:

Month.	1873–74.	1874–75.	1875–76.	1876–77.		1877–78.		1878–79.		1879–80.		1880–81.	
	Quantity.	Quantity.	Quantity.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.
July	------	------	------	.10	2	.18	2	------	2	------	2	------	------
August	------	------	------	------	1	------	------	------	3	------	2	------	------
September	------	------	------	.15	5	------	------	.57	3	------	2	------	------
October	.60	2.24	.30	4.74	10	.45	4	1.85	2	.70	5	.05	1
November	.60	9.18	7.83	.25	2	1.62	8	.65	3	2.98	9	.35	2
December	10.18	.31	4.10	------	------	1.75	8	.31	6	5.06	14	12.57	18
January	5.60	6.15	5.28	4.19	9	10.82	16	3.84	11	1.71	7	10.48	11
February	1.80	.30	4.87	1.42	5	11.63	17	5.65	9	2.19	9	3.95	14
March	5.25	1.65	4.55	.96	7	4.30	16	7.96	15	1.70	9	.88	3
April	1.25	------	.93	.22	5	1.18	6	1.17	12	8.46	18	1.40	8
May	.75	.10	.45	.33	5	.40	2	1.39	7	1.04	5	.50	6
June	------	1.64	.24	------	5	------	------	.16	1	------	------	1.16	2
Amount	26.03	21.57	28.55	12.36	51	32.33	79	23.55	74	23.84	82	31.34	65

Month.	1881–82.		1882–83.		1883–84.		1884–85.		1885–86.		1886–87.		1887–88.		1888–89.	
	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.	Quantity.	Days.
July	------	------	------	2	------	------	------	------	.02	2	.15	1	.01	2	------	------
August	------	------	------	------	------	------	.25	1	.00	0	.00	0	.00	1	------	------
September	.40	1	.42	2	1.00	2	.35	3	.05	2	.05	1	.27	2	.92	3
October	.82	7	2.65	9	1.03	7	2.80	4	.30	2	1.59	5	.00	0	.06	2
November	1.49	5	4.33	7	.90	3	.05	3	11.11	17	.45	6	.78	4	3.52	9
December	5.09	10	1.14	9	1.15	6	7.73	13	4.33	8	3.60	6	3.22	8	4.82	13
January	2.42	9	1.95	3	3.81	9	1.92	7	8.12	13	1.57	7	6.42	14	.90	7
February	2.05	10	.70	5	5.25	10	.48	3	.30	4	7.83	16	1.02	4	.62	5
March	4.20	11	3.33	8	8.59	11	1.07	5	2.57	11	.71	6	4.44	8	7.60	13
April	1.51	8	2.20	8	5.79	10	3.12	9	5.11	11	2.35	5	.10	1	.93	10
May	.15	3	3.50	11	.55	5	.10	1	.30	5	.10	4	.38	5	------	------
June	------	2	------	------	3.03	10	.08	6	.00	0	.05	2	.16	7	------	------
Amount	18.13	66	20.22	64	31.10	78	17.95	54	32.21	75	18.45	59	17.10	56	19.37	62

Mean annual rainfall for fifteen years, 23.66 inches.

Highest and Lowest Temperatures at Salinas, Monterey County.—The following table of maximum and minimum temperatures for each month, at Salinas, was furnished by E. K. Abbott, M.D., and covers a period from May, 1872, to date:

Year.	Jan.		Feb.		March.		April.		May.		June.		July.		August.		Sept.		Oct.		Nov.		Dec.	
	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.	Highest Temperature.	Lowest Temperature.
1872	----	----	----	----	----	----	----	----	84	47	90	54	71	56	79	52	80	47	87	36	82	32	80	22
1873	76	36	70	30	84	36	----	----	90	----	----	----	78	53	79	52	76	46	87	30	84	35	66	36
1874	66	31	66	32	70	33	70	43	82	45	79	50	77	52	76	52	88	48	85	46	75	33	73	23
1875	66	28	71	32	78	32	80	33	77	48	78	49	70	52	76	51	77	50	79	39	70	38	68	31
1876	62	30	69	30	73	32	79	40	68	44	79	40	76	51	75	52	82	51	76	42	81	35	76	31
1877	77	21	73	25	70	37	64	44	70	47	88	52	76	54	79	54	87	50	79	35	78	34	69	34
1878	67	30	63	28	74	37	72	41	70	48	71	51	70	51	71	52	76	50	85	42	78	30	80	26
1879	64	26	72	29	80	32	70	44	75	45	78	52	72	52	87	53	80	50	90	42	75	30	71	20
1880	70	25	64	25	65	32	64	41	87	44	76	49	72	52	70	52	71	45	86	41	83	28	70	38
1881	68	32	75	36	78	32	76	45	73	45	74	52	86	52	70	51	78	44	70	31	74	29	72	33
1882	65	22	66	28	76	32	70	42	72	44	71	53	72	53	73	52	74	50	81	40	75	30	76	28
1883	66	20	81	24	84	44	68	40	85	45	94	53	74	54	78	52	96	50	76	38	75	29	75	32
1884	65	30	76	25	72	34	72	44	80	50	72	54	75	53	76	54	75	45	84	37	80	40	66	26
1885	70	33	75	32	82	36	82	41	76	50	73	51	73	54	76	57	82	46	72	38	72	30	74	32
1886	68	29	73	38	68	35	75	38	77	49	71	51	76	52	78	54	88	46	69	39	80	31	78	32
1887	70	28	72	29	82	33	70	40	70	44	78	50	72	43	70	53	78	47	92	42	78	28	66	32
1888	63	22	74	35	70	30	79	42	74	51	75	51	84	54	76	52	74	47	82	40	77	31	67	38
1889	64	28	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Highest and lowest temperatures in sixteen and seventeen years	77	20	81	24	84	30	82	33	90	44	94	40	86	43	87	51	96	44	92	30	84	28	80	20

Rainfall at Salinas, Monterey County.—The rainfall of Salinas, Monterey County, was furnished by Dr. E. K. Abbott, and extends from July, 1872, to date, showing the rainfall by months, years, and seasons; also the averages:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Inches.
1872							none	none	.01	.02	.02	6.80		1872–73	13.45
1873	3.40	2.40	.80	none	none	none	none	none	.10	.10	.20	4.25	11.25	1873–74	11.17
1874	3.42	none	2.15	.95	none	none	none	none	none	1.83	1.42	none	9.77	1874–75	8.59
1875	4.50	.15	.69	none	none	none	none	none	none	none	5.17	2.18	12.69	1875–76	21.59
1876	6.16	3.55	4.52	none	.01	none	.10	none	.05	1.04	.05	none	15.48	1876–77	4.74
1877	2.54	.16	.30	.10	.40	none	none	none	none	.12	1.00	2.39	7.01	1877–78	23.82
1878	7.05	8.77	2.57	1.92	none	none	none	none	.05	.60	.20	.35	21.51	1878–79	10.94
1879	2.42	2.81	1.85	1.69	.82	.15	none	none	none	1.05	1.08	2.28	14.15	1879–80	13.22
1880	1.65	1.16	1.64	3.90	.46	none	none	none	none	none	.57	5.56	14.94	1880–81	14.07
1881	3.32	2.32	1.26	.66	none	.38	none	none	.10	.28	.67	1.24	10.23	1881–82	12.93
1882	1.78	2.31	4.86	1.01	.49	.19	none	none	.38	1.43	.65	1.95	15.05	1882–83	11.79
1883	.91	.95	2.26	1.28	1.98	none	none	none	.19	1.19	.25	.90	9.91	1883–84	20.25
1884	1.71	4.49	5.09	3.05	.72	2.66	none	.18	.11	1.79	.28	4.46	24.54	1884–85	9.48
1885	1.09	.05	.19	1.21	.12	none	none	none	.02	.08	6.60	1.30	10.66	1885–86	20.76
1886	5.10	1.47	2.16	3.83	.20	none	none	none	none	.62	.82	.72	14.92	1886–87	9.88
1887	.75	4.73	.54	1.63	.07	none	none	none	.71	none	.98	2.16	11.57	1887–88	13.10
1888	4.15	.53	3.28	none	.89	none	none	none	.56	none	1.64	2.20	13.25	1888–89	*6.69
1889*	.64	1.65													
Totals	50.59	37.50	34.16	21.23	6.16	3.38	.10	.18	2.28	10.15	21.60	38.74	216.93		219.78
Averages	2.976	2.206	2.135	1.327	.385	.211	.006	.011	.134	.597	1.271	2.279	12.760		12.928

* Up to March 1, 1889.

Weather at Lodi, San Joaquin County.

The following table, compiled from observations taken by Ezra Fisk, three miles south of Lodi, shows the mean temperature of San Joaquin County at sunrise, at 2 p. m., and at sunset, for every month for seven consecutive years, including 1882, 1883, 1884, 1885, 1886, 1887, 1888, and January and February, 1889. Very few localities on the coast possess so equable and moderate a climate as these figures indicate:

Month.	At Sunrise.	At 2 p. m.	At Sunset.	Mean.
1882—January	34.54	53.19	47.73	45.15
February	34.67	54.85	49.39	46.30
March	41.19	63.28	55.74	53.40
April	42.62	67.53	56.80	55.65
May	48.71	79.80	65.58	64.69
June	51.13	83.06	68.10	67.43
July	55.45	90.19	70.41	72.05
August	52.29	89.38	77.10	72.92
September	51.33	83.36	74.00	69.56
October	46.45	68.25	66.06	60.25
November	37.50	58.13	52.96	49.53
December	36.48	57.00	52.09	48.52
Yearly mean				58.78
1883—January	34.10	49.32	45.32	42.91
February	32.78	57.03	50.50	46.77
March	42.12	69.93	60.48	57.51
April	41.60	67.56	57.03	55.39
May	49.48	74.16	62.35	61.99
June	53.93	89.03	72.93	71.85
July	55.45	89.61	75.42	73.49
August	52.25	81.87	75.83	69.98
September	53.60	87.30	77.70	72.86
October	44.54	69.61	63.64	59.26
November	36.90	60.46	56.60	51.32
December	36.80	52.67	48.77	46.08
Yearly mean				59.11
1884—January	35.80	55.09	49.93	46.94
February	37.99	55.43	51.13	48.18
March	43.83	61.77	55.12	53.73
April	45.66	67.10	58.16	56.97
May	50.64	76.71	63.93	63.76
June	54.00	76.83	64.63	65.15
July	52.93	86.19	73.48	70.86
August	54.73	87.96	75.93	72.87
September	48.30	78.96	69.86	65.70
October	45.35	75.83	65.61	62.26
November	39.63	67.63	61.10	56.08
December	38.64	56.16	51.74	48.84
Yearly mean				59.27

WEATHER AT LODI—Continued.

MONTH.	At Sunrise.	At 2 P. M.	At Sunset.	Mean.
1885—January	40.54	54.00	49.35	47.96
February	40.57	64.75	57.39	54.23
March	43.32	73.45	62.77	59.84
April	47.50	74.26	61.93	61.23
May	48.86	81.25	66.32	65.44
June	49.53	81.26	65.93	65.57
July	54.77	86.29	72.35	71.13
August	56.38	90.93	78.67	75.32
September	52.93	86.60	77.03	72.18
October	48.32	78.61	70.90	65.94
November	48.10	62.00	57.80	55.30
December	43.64	55.09	51.06	49.94
Yearly mean				62.00
1886—January	40.80	53.06	49.10	47.65
February	43.28	63.35	56.21	54.28
March	39.48	62.96	54.45	53.29
April	46.23	67.90	58.01	57.38
May	47.80	78.61	64.19	63.53
June	53.56	87.00	71.90	70.82
July	56.29	89.64	76.74	74.22
August	56.35	90.83	77.41	74.86
September	50.40	85.40	74.60	70.13
October	42.80	71.90	64.19	59.63
November	35.70	62.30	56.76	51.58
December	40.80	59.06	53.38	51.08
Yearly mean				60.70
1887—January	36.83	57.71	51.90	48.81
February	36.85	52.71	47.64	45.73
March	41.51	71.64	61.87	58.34
April	43.83	70.90	59.50	58.07
May	47.64	78.93	64.74	63.77
June	52.40	79.66	69.70	67.25
July	52.83	89.80	73.43	72.02
August	53.19	88.03	75.22	72.14
September	53.60	86.73	76.13	72.15
October	47.58	82.00	72.71	67.43
November	38.10	67.66	60.23	55.33
December	36.58	54.52	47.96	46.35
Yearly mean				60.61
1888—January	37.19	50.45	45.06	44.23
February	39.41	62.17	55.62	52.40
March	41.29	65.67	56.09	54.35
April	45.80	77.96	64.50	62.75
May	49.45	80.71	62.67	64.67
June	56.56	82.43	69.43	69.47
July	56.51	92.58	75.09	74.72
August	57.16	90.22	80.09	75.82
September	59.40	89.06	77.83	75.43
October	50.32	78.96	69.71	66.33
November	44.23	63.76	58.76	55.58
December	45.96	54.83	50.51	50.43
Yearly mean				62.13
1889—January	34.80	53.87	48.13	45.60
February	36.64	61.71	53.57	50.64

Rainfall at Lodi, San Joaquin County—J. D. Huffman, Observer.

Month.	1887.	1888.	1889.
January	.....	5.09	.35
February	.....	.44	.65
March	.....	2.59	.....
April	.....	.11	.....
May	.....	.61	.....
June	.....	.43	.....
July	.....	none	.....
August	.....	none	.....
September	.....	.88	.....
October	none	none	.....
November	.77	3.61	.....
December	4.54	3.56	.....

Total for season of 1887-8, 14.58; 1888-9 (up to March 1, 1889), 9.05.

Meteorological Record of Fresno, California.

By J. R. Williams, Observer Signal Corps.

The following shows the annual meteorological summary of Fresno, California, latitude 36° 43′, longitude 119° 49′, for the year ending December 31, 1888. Very much that is of interest, and instructive as well, can be gleaned from these statistics. The maximum, minimum, and mean temperature, when compared with other sections of the State, show the climate of Fresno to be, what is claimed for it, dry, warm, and comparatively equable. There is very much more that could be said, but each person will readily find those points in which he is most directly interested:

Mean Barometer Readings.

Month.	Monthly Mean.	Highest Observed.	Date.	Lowest Observed.	Date.	Absolute Range.
January	29.800	30.25	17	29.26	4	0.99
February	29.742	29.96	19	29.46	27	0.50
March	29.688	30.11	11	29.26	8	0.85
April	29.680	29.89	6	29.40	16	0.49
May	29.565	29.75	8	29.39	11	0.36
June	29.558	29.75	30	29.34	16	0.41
July	29.561	29.86	12	29.42	16	0.44
August	29.508	29.71	2	29.30	11	0.41
September	29.510	29.72	30	29.25	11	0.47
October	29.598	29.79	22	29.40	5	0.39
November	29.685	29.86	6	29.39	23	0.47
December	29.744	29.97	2	29.20	22	0.79
Annual means	29.637	.....	.....	.....	.....	.....

Elevation of surface of mercury in barometer cistern above mean sea-level on December 13, 313 feet.

Mean Temperature from Self-Regulating Instruments.

Month.	Monthly Mean.	Maximum.	Date.	Minimum.	Date.	Absolute Range.	Mean Maximum.	Mean Minimum.
January	44.1	68.5	26	19.6	16	48.9	53.0	35.2
February	53.2	83.0	26	29.6	29	53.4	65.5	40.4
March	54.1	77.1	21	28.1	1	49.0	65.5	41.6
April	67.1	97.5	14	40.9	6	56.6	81.9	50.3
May	68.6	96.2	12	46.1	23	50.0	82.6	53.4
June	74.1	103.5	22	50.5	7	53.0	88.2	58.5
July	80.6	109.2	16	53.5	12	55.7	99 5	63.9
August	82.9	111.1	24	56.1	1	55.0	101.5	64.6
September	80.3	110.9	11	54.5	29	56.4	97.6	63.8
October	66.2	93.5	11	41.0	25	52.5	82.3	50.7
November	53.7	78.0	2	34.8	13	43.2	64.6	44.0
December	47.9	65.9	16	34.6	3	31.3	54.2	42.4
Annual means	64.4						78.0	50.7

Month.	Mean Dew Point.	Mean Relative Humidity.	Mean Cloudiness.	Total Amount of Precipitation.
January	38.3	81.2	4.2	1.75
February	44.3	74.2	2.0	0.13
March	45.3	74.6	3.1	1.95
April	49.4	56.6	1.8	0.22
May	51.3	57.9	2.3	0.56
June	53.4	51.8	1.5	trace.
July	54.1	45.4	1.2	trace.
August	52.6	40.8	0.8	trace.
September	56.4	49.0	1.2	0.06
October	49.3	59.0	0.7	0.00
November	46.3	78.8	3.2	2.38
December	45.8	93.0	7.3	1.71
Annual means	48.8	60.2	2.4	8.76

Elevation of thermometer bulbs above ground on December 31, 46 feet.

Velocity and Direction of Wind.

Month.	Total Miles.	Miles per hr.	Direction.	Date.	Prevailing Direction.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calms
January	2,887	18	N.	14	E.	8	6	19	7	18	4	12	12	7
February	2,674	18	N.W.	18	N.	21	3	11	8	17	3	5	15	4
March	3,590	24	S.E.	1	N.W.	18	4	6	17	11	2	9	19	7
April	3,857	20	N.W.	25	N.W.	27	0	6	4	4	0	12	36	1
May	4,501	20	N.W.	31	N.W.	12	1	2	1	3	7	27	40	0
June	5,767	18	N.W.	3	N.W.	12	0	0	1	3	1	11	61	1
July	4,425	20	N.W.	31	N.W.	19	0	3	1	6	1	7	25	0
August	3,996	18	N.W.	12	N.W.	15	0	0	1	3	3	9	31	0
September	3,564	24	N.W.	15	N.W.	10	2	3	4	1	3	7	30	0
October	2,976	15	N.	6	N.W.	16	1	5	5	3	1	3	24	4
November	2,248	18		16	N.W.	7	4	7	11	6	4	4	12	5
December	2,076	15	E.	22	S.E.	5	3	8	10	9	7	10	6	2
Annual Means	42,504				N.W.	170	24	70	70	84	36	116	311	31

The following table shows the clear, fair, cloudy, foggy, and rainy days, minimum temperature below 32° and maximum above 90°, with number of thunder storms for each month of the year 1888, at Fresno:

Month.	Clear Days.	Fair Days.	Cloudy Days.	Foggy Days.	.01 Inch or More.	Minimum Temperature below 32°.	Maximum Temperature above 90°.	Thunder Storms.
January	13	11	7	0	6	12	0	0
February	21	8	0	0	1	1	0	0
March	18	10	3	0	8	1	0	0
April	23	7	0	0	2	0	8	0
May	21	9	1	0	5	0	6	1
June	21	9	0	0	0	0	12	0
July	27	2	2	0	0	0	28	0
August	30	0	1	0	0	0	30	0
September	23	6	1	0	1	0	24	1
October	27	4	0	0	0	0	3	0
November	14	6	10	2	7	0	0	1
December	3	9	18	8	6	0	0	0
Totals	241	81	43	10	36	14	111	3

The rainfall for the past seven years has been as follows at Fresno:

1882	6.70
1883	7.64
1884	15.98
1885	7.10
1886	19.42
1887	8.40
1888	6.48
Average	10.24

Table Showing the Average Temperature and Rainfall for the San Joaquin Valley Counties.

The following named counties are represented in this table: San Joaquin, Merced, Fresno, Tulare, and Kern. The lowest temperature below 20° was recorded in the following named counties: Fresno, Tulare, and Kern. The lowest being for each county named above, as follows: 15°, 10°, 16°, respectively. Taking elevation in consideration, the southern end of the San Joaquin Valley is much colder than any portion of the Sacramento Valley. For instance, Auburn, in Placer County, Sacramento Valley, at an elevation of 1,363 feet, has a minimum record of but 18°, while Delano, only 319 feet, has a minimum record of 16°, or two (2) below Auburn. This table will convince the wayfarer, though a stranger, that he must come north to the Sacramento Valley to find a more equable climate, unless he decides to cross into Santa Barbara or Los Angeles Counties and winter there; even then the great Sacramento Valley will compare favorably with those counties in a great many respects. The mean annual temperature of Los Angeles and Santa Barbara is the same as Sacramento, but the average winter temperature of the two former places is much milder than that of Sacramento City:

Stations and Counties.	Elevation—Feet.	Average Winter Temperature.	Average Spring Temperature.	Average Summer Temperature.	Average Autumn Temperature.	Average Annual Temperature.	Highest Temperature.	Lowest Temperature.	Average Seasonal Rainfall—Inches.
San Joaquin County:									
Stockton	20	48.1	59.7	72.3	61.7	60.5	110	20	13.54
Lathrop	25	46.3	59.4	72.1	60.6	59.6	106	20	11.98
Tracy or Ellis	76	48.8	62.3	77.6	64.6	63.3	112	20	9.10
Farmington	111	46.2	60.2	75.6	62.6	61.2	114	20	15.57
Merced County:									
Merced	171	49.2	61.2	78.4	64.5	63.3	112	20	11.09
Fresno County:									
Borden	274	48.4	61.5	82.2	67.1	64.8	118	15	9.27
Fresno	295	50.2	64.9	84.1	67.6	66.7	115	18	9.57
Kingsburgh	301	49.0	62.5	82.6	66.2	65.1	112	10	9.36
Tulare County:									
Goshen	286	49.1	63.6	82.1	67.5	65.6	116	14	7.76
Tulare	289	46.6	62.8	83.4	65.1	64.5	116	14	6.89
Visalia	335	45.4	59.4	80.8	60.3	61.5	109	18	9.39
Tuohy's Ranch, Lewis Valley	440	47.1	62.5	79.4	62.3	62.8	106	22	11.15
Lemoore	227	46.1	62.0	81.3	63.8	63.3	111	18	9.82
Kern County:									
Delano	319	50.4	64.7	83.8	68.0	66.7	118	16	6.34
Sumner	422	49.6	65.0	85.1	65.5	66.3	113	18	5.02
Caliente	1,290	51.8	63.0	82.8	66.3	66.0	112	23	10.98
Keene	2,705	44.6	55.0	73.6	59.4	58.2	108	9	13.28
Tehachapi	3,964	39.1	51.8	72.6	54.8	54.6	102	zero.	11.04
Mojave	2,751	47.4	59.6	82.1	66.2	63.8	114	12	4.94

Climate of San Luis Obispo County.

By Signal Service Observer, Mr. J. E. Lewis.

With persons who are thinking of emigrating to any particular section, the question of climate is always one of prime consideration. If a man lives in a malarial section, or one subject to the ravages of fever or consumption, it is a duty which he owes to himself and family to remove, provided he possesses the means, to a place where these baneful conditions do not exist. Many portions of the Eastern States are cursed with just such disease-producing climatic conditions. San Luis Obispo County, on the contrary, is free from any of the causes that produce the unfavorable conditions in many of the Eastern States. It is well known that a wide difference in temperature exists in corresponding latitudes on the Atlantic coasts of the United States and of Europe, and the cause has been well established. While along the eastern shores of our own country courses the Arctic Ocean current, bearing down from the Northern Sea its icy waters, the western countries of Europe are warmed by the mighty Gulf stream, which bears to their shores the thermal waters of the tropical ocean. Equally fortunate with the western shore of Europe, California along its whole length of nearly eight hundred miles luxuriates in the balmy breezes of the great Japan current—that mighty stream of warm water, which perennially washes directly against the western shores of America. The temperature of the winds blowing over it is of course affected by its heat, and they carry modifying influences inland, and as a consequence during the greater portion of the year, San Luis Obispo County enjoys the balmy healthfulness of the breezes, that blowing fresh from the broad bosom of the Pacific, are moderated and softened by its

warm stream, and yet being from the mighty expanse of the ocean are pure, and not contaminated, as is too often the case with the warm winds of less favored regions.

But it must not be supposed that every portion of California is equally fortunate, for strictly speaking there is no such thing as a climate of the State. Within its borders may be found every variety of climate that exists in the United States, from Maine or Minnesota, to Florida or South Carolina. "The winters of the Sierras are severe enough to satisfy the most enthusiastic admirer of the rigors of a northern winter; the summer heat of some of the southern and interior counties is torrid enough to make a visitor from the tropics feel quite at home, while the summer and autumn fogs of San Francisco could be best appreciated by a native of Labrador, or a Massachusetts fisherman who has spent years on the banks of Newfoundland." Many people are under the impression that if they but come to California they cannot fail to derive all the benefits of its "glorious" climate. As already shown, such cannot be the case; only in favored portions can be enjoyed that which has made the climate of California famous the world over. A necessary element to a proper estimate of the value of a home in California is the length of the productive season. If three crops can be raised in one season on one piece of land it is worth three times as much as that on which one can be raised. Even more than that; the single crop has to be worked in the short season of growth; the triple crop is worked by one man in the same time or during the year, employing his whole time, whereas two thirds of the vital energy of the worker is lost in the contest with the unproductive cold weather. Here the gain of three years is condensed into one, without the loss of two years of life and the food and energy necessary to live through the unproductive and wasting period.

With these facts before our readers, we append various tables taken from the official records of this county showing the comparative and absolute rainfall, mean temperature, etc., that our readers may make their own estimates of what is claimed, and justly, for the favored county of San Luis Obispo.

Comparative Annual Rainfall.

Rainfall at San Luis Obispo, as compared with other points in California and the United States:

Place.	State.	Inches.	Place.	State.	Inches.
San Francisco	California	21.46	Bismarck	Dakota	21.27
San Luis Obispo*	California	20.69	Dodge City	Kansas	20.09
Sacramento	California	19.25	North Platte	Nebraska	19.97
Santa Barbara	California	15.31	St. Vincent	Minnesota	18.62
Los Angeles	California	14.92	Lewiston	Idaho	17.14
Monterey	California	13.01	Salt Lake City	Utah	16.91
Salinas	California	12.03	Helena	Montana	15.13
Stockton	California	11.37	Denver	Colorado	14.98
San José	California	10.62	Prescott	Arizona	14.51
Chualar	California	10.18	Boise City	Idaho	13.30
San Diego	California	9.44	El Paso	Texas	12.11
Soledad	California	7.75	Cheyenne	Wyoming	10.85
Riverside	California	7.66	Phœnix	Arizona	7.53

*Average as taken at San Luis Obispo City for the last seventeen years.

Rainfall at San Luis Obispo during the past Seventeen Years.

Year.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Total.
1869–70	------	------	.84	.66	.78	.71	4.85	.74	2.40	.85	------	------	11.83
1870–71	------	------	.68	.38	2.90	1.51	4.43	------	2.79	.28	------	------	12.97
1871–72	------	------	------	2.40	13.93	5.16	3.45	.71	1.37	------	------	------	27.02
1872–73	------	------	------	------	6.00	5.00	1.79	------	------	------	------	------	12.79
1873–74	------	------	------	------	7.96	4.29	4.04	3.23	1.00	------	------	------	20.52
1874–75	------	------	4.28	2.05	.48	12.10	.28	.50	------	------	------	------	19.69
1875–76	------	------	------	6.20	2.20	9.87	5.29	5.30	1.26	------	------	------	30.12
1876–77	------	------	1.16	------	------	4.83	.42	1.74	------	------	------	------	8.15
1877–78	------	------	------	1.42	3.90	7.88	11.91	2.74	2.75	------	------	------	30.60
1878–79	------	------	------	1.50	2.58	1.78	2.15	1.60	1.80	.25	------	------	11.66
1879–80	------	------	.75	1.40	3.03	1.75	7.23	2.36	8.78	.52	------	------	25.82
1880–81	------	------	------	.48	13.35	4.71	1.90	1.40	1.85	------	------	------	23.69
1881–82	------	.40	1.65	.25	2.00	.85	3.40	6.75	1.73	------	------	------	17.03
1882–83	------	------	.69	2.95	.44	1.50	1.60	4.88	1.10	3.85	------	------	17.01
1883–84	------	------	------	------	3.56	10.57	10.21	12.41	3.39	------	2.26	------	42.40
1884–85	------	------	2.17	.13	8.85	2.25	------	.94	3.15	.10	------	------	17.59
1885–86	------	------	.04	12.90	3.67	5.78	.79	2.37	3.75	------	------	------	29.30
1886–87	------	------	.25	1.25	1.06	1.10	9.60	1.29	1.56	.36	.07	.02	16.56
1887–88	------	2.05	.25	1.40	3.15	7.02	.28	3.84	.14	.16	.04	------	18.33
1888–89	------	------	------	4.48	3.36	1.40	2.08	7.51	.61	------	------	------	*19.44

*Up to May 1, 1889.

The average precipitation for the last nineteen seasons is 20.69 inches.

Meteorological Report for 1888.

The following meteorological report for the year 1888 was compiled for the "Republic," by J. E. Lewis, Signal Service Agent at this city. The record is from January 1 to December 31, 1888:

Number of clear days, 221; number of cloudy days, 117; number of fair days, 28. Highest temperature, 96°; lowest temperature, 27°. Greatest velocity of wind, 32 miles per hour. Number of days in which .01 of an inch or more of rain fell, 42; amount of rain in year, 11.38 inches; amount for season of 1887–88, 18.33 inches. Highest barometer, 30.098; lowest barometer, 26.251.

The rainfall for the season was not as favorable for vegetation as its quantity would indicate, from the fact that heavy rains fell in September and October, 1887, which were of no benefit whatever. There were but very light rains after January.

During January the weather was colder than ever before recorded in this section, the record of lowest self-registering thermometer being 27°, and numerous outdoor water pipes were frozen and bursted, an unprecedented occurrence. The highest thermometer was 96°, in October.

Weather for January, 1889, at San Luis Obispo.

From the records of Mr. J. E. Lewis, Signal Service Observer.

Rainfall, 1.50 inches, making a total for the season of 8.34 inches. Rain fell on 4 days. There were 5 cloudy days, 5 partially cloudy, and 21 clear days. Frost is recorded on 4 mornings. Highest temperature, 70°, on the sixth; lowest, 35°, on the twentieth; lowest maximum, 55°, on the thirteenth; highest minimum, 50°, on the sixth and eleventh; average maximum temperature, 61.88°; average minimum temperature, 42.68°. Greatest velocity of wind, 20 miles an hour, on the fourth; 8 days calm; average velocity of wind in the morning, 3.84 miles per hour; average greatest velocity of wind in the evening, 7.32 miles per hour; heaviest wind from the south-

east; wind from northwest, parts of 18 days; from east, parts of 13 days; from north, parts of 7 days; from south and southeast, parts of 14 days. Highest barometer, 29.995, on the first; lowest barometer, 29.220, on the fourteenth. Elevation of point of observation, 366 feet above the level of the sea, and 206 feet above the level of the depot of the Pacific Coast Railway in the City of San Luis Obispo. Latitude, 35° 22′ north, and longitude 120° 38′ west. January is the coldest month of the year. The temperature at the hospital, where the Signal Service Station is located, shows less variation than the lower lands of the city, the difference being about 5° in extremes; the average being about the same. The rainfall is also slightly less.

Comparative Mean Temperature of Six Coldest Months at San Luis Obispo, California.

Temperature of six coldest months as compared with the most noted places in the world, regarding climate:

Place.	State.	Degrees Fahrenheit.
San Luis Obispo	California	56.15
Santa Barbara	California	56.55
City of Mexico	Mexico	56.03
City of Lisbon	Portugal	54.70
City of San Remo	Italy	53.80
City of Mentone	France	53.21
City of Nice	Italy	48.45

Weather Report.

The U. S. Signal Service established a station at San Luis Obispo, in July, 1885, and a fire occasioned its removal after March, 1886. The following table gives the observations for the eight months of its existence. The remaining four months are always uniformly fair and pleasant:

1885 and 1886.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.
Days upon which rain fell*	0	0	0	17	5	13	3	9	47
Days upon which snow fell	0	0	0	0	0	0	0	0	0
Days upon which frost appeared†	0	0	0	0	3	0	0	0	3
Days upon which fog appeared†	9	0	0	0	0	0	0	0	9
Days which were cloudy	------	0	0	11	5	12	1	5	34
Days which were fair	------	0	0	6	7	8	10	11	42
Days which were clear	31	31	31	13	19	11	17	15	167
Highest velocity of wind	‖5	28	32	44	36	34	28	42	------
Mean temperature	62.0	63.2	63.0	56.7	55.7	52.7	58.4	50.4	57.8
Total number of days	31	30	31	30	31	31	28	31	243

*Rain usually falls during hours from sunset to sunrise.
†Fog and light frosts appear only late in the evening and early in the morning.
‖Miles per hour.

Santa Barbara, Santa Barbara County.

By Professor Hugh D. Vail.

Table of temperature, rainfall, etc., at Santa Barbara, for the years 1885, 1886, 1887, and 1888:

Month.	Monthly Mean Temperature.	Mean of Warmest Day.	Mean of Coldest Day.	Highest Temperature.	Lowest Temperature.	Rainfall, Inches.
1885—January	53.2	57.0	49.5	60.0	39.0	1.23
February	56.7	65.5	51.5	81.0	41.0	0.07
March	59.1	62.5	56.0	79.0	45.0	0.35
April	60.7	70.5	54.0	80.0	44.5	3.00
May	60.0	64.6	54.0	75.0	44.0	0
June	62.4	64.5	58.5	83.0	45.0	0
July	66.1	73.0	62.5	89.0	50.0	0
August	68.0	76.0	61.5	92.0	52.0	0
September	66.8	78.8	62.5	103.5	51.5	0
October	62.9	72.0	58.5	89.5	47.0	0.19
November	58.9	64.8	50.0	77.5	40.0	9.84
December	57.2	65.7	52.0	81.5	40.0	2.47
Annual average	61.2	67.9	55.9	103.5	39.0	17.15
1886—January	55.0	73.5	47.5	85.0	35.0	5.12
February	59.6	70.0	45.0	85.0	39.0	1.19
March	53.1	59.5	46.2	71.0	36.0	2.03
April	55.7	61.5	50.5	74.0	41.0	3.40
May	60.5	65.5	54.0	80.5	44.0	0
June	62.0	67.5	58.3	80.0	48.0	0
July	66.3	72.0	63.5	84.5	52.5	0
August	68.2	72.0	63.2	85.0	54.0	0
September	63.8	68.3	57.0	79.0	48.0	0
October	58.3	62.5	51.7	79.0	42.0	0.39
November	56.3	66.5	49.8	83.0	37.5	0.87
December	55.8	65.8	49.5	81.5	40.0	0.86
Annual average	59.6	67.0	53.0	85.0	35.0	13.86

Month.	Monthly Mean Temperature.	Mean of Warmest Day.	Mean of Coldest Day.	Highest Temperature.	Lowest Temperature.	Rainfall, Inches.	Clear Days.	Fair Days.	Cloudy Days.
1887—January	54.7	63.5	49.0	79.0	37.0	.31	------	------	------
February	50.4	61.1	45.3	79.2	37.0	8.64	------	------	------
March	57.0	64.8	52.0	82.6	43.0	.13	------	------	------
April	58.4	66.8	51.0	80.5	41.0	1.43	------	------	------
May	60.0	67.0	53.3	86.0	43.5	.33	------	------	------
June	63.7	79.0	59.0	95.0	44.0	.03	------	------	------
July	64.6	71.3	60.9	85.5	40.0	.00	29	0	2
August	64.8	69.7	62.0	81.0	53.0	.00	28	2	1
September	66.0	70.5	61.5	81.2	51.0	.38	24	4	1
October	65.0	74.0	59.3	91.8	48.5	.31	24	3	3
November	58.9	65.3	47.5	84.6	39.5	1.10	24	2	4
December	52.8	59.6	49.0	74.2	38.0	4.43	26	1	4
Annual average	59.7	67.7	54.2	95.0	37.0	*17.09	†155	†12	†15

*Total for year. †Total for six months.

The following is a summary of the thermometrical and other observations of the weather at Santa Barbara during the year 1888:

Month.	Mean Temperature of Month.	Mean of the Warmest Day.	Mean of the Coldest Day.	Rainfall, Inches.	Wind Movement, Miles.
January	49.0	58.7	41.0	10.15	----------
February	53.8	57.5	49.0	1.30	----------
March	53.0	60.5	46.0	3.86	2,703
April	59.9	75.0	53.0	0.16	2,977
May	57.6	64.5	51.7	0.02	2,971
June	64.4	69.0	59.5	----------	3,115
July	67.0	72.0	63.0	----------	3,292
August	66.3	72.0	63.5	----------	2,801
September	67.9	76.2	63.2	0.03	2,705
October	63.5	76.9	59.0	0.07	2,193
November	59.8	64.3	54.5	5.62	2,409
December	56.5	63.0	52.0	5.05	2,433

The mean temperature of the whole year was 59.9°, and that of three summer months 65.9°, a difference of only 6°. There were but 28 days during the year when the temperature rose above 80° in the warmest part of the day, and only 16 when it fell below 40° at night. On the warmest night in the year it fell to 62.5°, and there were only 8 nights when it did not fall as low as 60°. The number of clear days in the year were 251; fair ones, 34; cloudy, 81. Rain fell on 28 days (not counting those in which the rainfall was less than .1 of an inch), with a total rainfall of 26.26 inches. For the season of 1887–88 it was 21.73 inches. The rains were mostly at night. There were but 10 days during the year that could be called rainy. The mean relative humidity for the year was 77. The movement of the wind in the ten months of which the record was kept was 27,599 miles; the meaning of which will be best understood by comparing this with the movement in the corresponding ten months at some other well known places not supposed to be windy, as Philadelphia on the Atlantic Coast, and San Diego on the Pacific, which, according to the official "Weather Review," was 74,930 miles at the former, and 40,223 at the latter.

Climatic Comparisons of Santa Barbara with that of San Remo and Mentone.

By Sergeant James A. Barwick, Observer Signal Corps, Sacramento, California.

Mentone and San Remo's climate, compared with Santa Barbara during each month of the year, shows that that of Santa Barbara is far superior as a summer and winter resort. The summers of San Remo and Mentone are as hot as those of the Sacramento and San Joaquin Valleys, and therefore cannot compare favorably with Santa Barbara, which has the finest and best summer temperature of any place on the Pacific Coast. The following temperature tables of Santa Barbara were compiled from Mr. Hugh D. Vail's records for 1885, 1886, and 1887, and is the average of these years. Those at Mentone are from M. de Brae's record of ten years. They are a valuable addition to tables already published for comparison with the California climate. Santa Barbara will be seen to far excel either San Remo or Mentone as a winter resort. Comparing Santa Barbara in summer, with the Italian climate, is simply a waste of words and space; for the table of comparison tells more plainly and more eloquently the great superiority of

the climate of Santa Barbara over the places mentioned. The table is as follows:

Santa Barbara, Mentone, and San Remo's Comparative Temperature Tables.

Month.	Mean Average Monthly Temperature at Santa Barbara.	Mean Average Monthly Temperature at Mentone, France.	Mean Average Monthly Temperature at San Remo, Italy.
January	54.3	48.2	47.2
February	55.6	48.5	50.2
March	56.4	52.0	52.0
April	58.3	57.2	57.0
May	60.2	63.0	62.9
June	62.6	70.0	69.2
July	65.7	75.0	74.3
August	67.0	75.0	73.8
September	65.6	69.0	70.6
October	62.1	64.0	61.8
November	58.0	54.0	53.3
December	55.3	49.0	49.3
Average for twelve months	60.1	60.4	60.1

The lowest temperature ever recorded at Santa Barbara was 28.5°, during the cold wave of January, 1888; while an acknowledged minimum temperature in ten years at Mentone has been recorded as 32°. But Mr. Bennett in his book says: " In more severe winters I have repeatedly known the thermometer to descend below 32° several nights consecutively, near the seashore, and at the outlet of the torrent beds, especially in the western bay. Slight films of ice then form on shallow pools on the road and near the torrents."

This has occurred at Santa Barbara upon but one night, and not as at Mentone several nights consecutively. The above table is one of the strongest advocates for Santa Barbara as being the very best winter climate in the northern hemisphere from year to year and month to month. Dr. Bennett says of Mentone, speaking of the ten years' mean obtained by him from 1859 to 1869 for six months each year, and those obtained by M. de Brea's ten years' record from 1850 to 1860, that such results show how very uniform the climate of Mentone is, especially when a sufficiently large number of years are thus compared. Now, if Dr. Bennett thinks the climate of Mentone so very uniform, what would he think of the comparison as above with Santa Barbara; the latter's mean yearly temperature as deduced from ten years of observation by different parties, with observations at different hours, is 60.2°, while in the above table the mean for each month and the year are the average of the three years—that of 1885, 1886, and 1887, and are the same as that made by other parties. It ought to do a Californian good to look at each month of the above table, and see how much warmer the Santa Barbara climate is in the winter, spring, and fall, and how much cooler it is in the summer than the far famed and much advertised Mentone and San Remo. Santa Barbara had two hundred and fourteen clear days out of two hundred and eighty-nine that were observed during 1887 by Mr. Hugh D. Vail, from whose records the above facts are obtained. Mentone and San Remo have but an average of two hundred and fourteen clear days out of three hundred and sixty-five. This comparison speaks much, yes, very much indeed, for Santa Barbara—not only as a winter resort, but a summer resort as well. Mentone and San Remo have about as hot a summer temperature as does Riverside and the Sacramento and San Joaquin Valleys, and being much more moist than the California points

mentioned, would make an atmosphere of almost suffocation, like New York, Philadelphia, and other eastern cities.

Comparative Los Angeles Weather Report.

The following tabulated data and information in reference to the meteorological conditions of Los Angeles were compiled from the records of the United States Signal Service Office, by George E. Franklin, Observer in charge of the station, and comprises a period from the establishment of the station in July, 1877, to December, 1888, inclusive. The tabulated matter will be found to contain valuable and comprehensive data, and cannot fail to be of interest as showing the climatic advantages of this section. The temperature tables contain the highest, lowest, and mean temperatures; the number of days the temperature was above 90° and below 32°, in each month and each year, with averages for the period considered. An examination of these tables will show that there were but thirteen days on which the temperature rose to or exceeded 100°, and nine days on which it fell to 32° or below. The average number of days annually on which the temperature exceeds 90° is only fifteen. The highest recorded temperature was 108.5°, and the lowest 28°. A fact to be noted in considering these tables is that during the time of greatest heat the percentage of moisture in the atmosphere is low, and modifies the temperature so that the heat is neither oppressive nor prostrating, which is well illustrated by laborers continuing work during the hottest period.

Highest, Lowest, and Mean Temperature for each Month, and Monthly Averages for the Period Compiled, at Los Angeles.

Year.	January.			February.			March			April.			May.			June.		
	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.
1877																		
1878	72.0	37.0	54.9	71.0	41.0	55.0	76.0	41.0	56.0	80.0	41.5	57.8	89.0	47.0	62.2	81.0	47.0	55.0
1879	73.7	36.0	52.2	80.0	38.6	55.5	99.0	42.5	58.5	88.5	42.2	58.7	97.0	43.0	61.0	103.5	50.5	65.8
1880	76.0	30.0	51.3	70.5	33.5	50.1	73.5	36.0	51.1	83.0	40.0	55.9	97.0	42.0	61.1	83.0	50.0	63.4
1881	71.0	37.0	51.7	86.0	42.5	57.9	89.0	37.0	55.8	64.0	48.0	61.4	89.3	41.0	62.7	88.0	48.0	65.6
1882	74.2	32.0	49.4	76.7	32.0	50.3	87.8	35.3	55.3	80.0	40.2	56.4	86.1	42.1	61.7	87.1	49.6	64.4
1883	82.0	30.0	53.5	82.0	28.0	52.3	84.0	42.6	56.7	89.0	39.0	57.3	100.0	39.5	62.1	100.0	52.0	68.8
1884	78.0	33.7	53.9	81.0	38.5	55.1	72.5	37.0	54.8	80.0	41.5	57.2	79.0	47.0	61.6	98.0	49.5	65.6
1885	71.6	38.0	53.9	81.0	36.3	56.6	85.1	42.3	60.6	88.6	44.8	61.9	80.0	48.6	63.5	90.1	47.0	65.0
1886	75.3	32.0	54.7	81.0	41.1	59.5	76.0	37.2	54.3	80.0	42.3	57.2	89.0	44.2	62.4	91.6	48.2	66.1
1887	79.6	33.1	55.4	81.5	35.4	51.6	85.0	41.1	59.1	87.0	40.3	59.1	92.0	44.5	63.1	100.1	46.7	66.1
1888	71.0	30.9	50.0	73.5	39.2	54.4	79.0	35.9	55.1	99.0	44.0	61.9	83.0	45.0	60.8	94.0	50.5	67.5
Averages	74.9	33.7	52.8	78.6	36.9	54.4	82.4	38.9	56.1	86.3	42.1	58.6	89.2	44.0	62.0	92.4	49.0	65.8

	July.			August.			September.			October.			November.			December.		
1877	93.0	55.0	71.1	87.0	56.0	70.0	93.0	52.0	69.6	80.0	43.0	63.4	86.0	45.0	62.1	81.0	36.5	56.0
1878	88.0	52.0	67.7	89.0	54.0	68.7	103.0	50.0	65.6	91.0	43.0	63.1	81.0	37.0	58.3	88.2	30.0	54.4
1879	84.5	52.0	66.8	97.5	53.0	69.5	101.0	47.0	67.2	96.5	42.5	64.3	84.5	36.5	55.2	76.0	30.0	51.9
1880	85.0	52.0	64.2	87.0	52.0	66.4	91.0	44.0	64.5	89.0	44.0	62.0	85.0	35.0	55.5	80.0	38.0	55.6
1881	93.1	52.1	68.8	99.8	52.1	69.4	102.0	50.0	67.9	82.3	43.0	60.9	80.8	34.2	57.5	79.3	35.3	54.7
1882	98.1	52.3	68.0	98.9	57.0	71.0	100.0	46.0	67.6	88.0	44.0	63.0	81.0	36.0	57.3	82.0	35.0	56.4
1883	90.0	52.5	69.8	98.0	50.0	69.8	103.5	53.0	71.9	83.0	43.5	61.0	84.0	42.0	59.2	80.0	37.0	56.3
1884	99.0	51.5	70.2	101.5	52.5	71.3	92.5	45.5	65.5	89.1	42.9	62.3	88.0	38.7	59.6	75.6	35.5	52.3
1885	98.5	52.4	70.0	105.6	51.2	72.7	108.5	51.2	69.5	102.3	41.6	64.8	78.5	40.3	59.5	82.0	40.3	57.9
1886	98.1	50.4	69.7	98.1	53.7	71.8	91.3	48.3	65.6	82.2	41.1	59.3	84.9	34.1	56.6	84.8	37.3	55.7
1887	98.1	51.1	69.5	93.6	52.1	68.5	91.0	49.2	68.2	93.2	47.2	65.0	86.0	38.8	60.0	73.2	35.2	53.7
1888	95.0	49.0	67.9	97.0	51.3	67.6	98.2	55.0	68.4	98.0	44.0	61.9	83.8	40.0	57.2	78.8	41.0	55.2
Averages	93.6	51.9	68.6	96.6	53.2	69.7	98.6	49.3	67.6	89.6	43.3	62.6	83.6	38.1	58.2	80.1	35.9	55.0

Table Showing the Prevailing Direction of Wind, Average Daily Movement, and Highest Velocity, at Los Angeles.

Year.	January.			February.			March.			April.			May.			June.		
	Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.	
		Average.	Max.		Average.	Max.		Average.	Max.		Average.	Max.		Average.	Max.		Average.	Max.
1877																		
1878	N.	126.5	26	N.	141.0	25	N.	119.0	20	S.W.	114.3	25	S.W.	111.6	16	S.W.	105.3	15
1879	N.E.	133.4	29	N.E.	193.1	17	S.W.	103.7	22	S.W.	127.4	23	S.W.	135.4	21	W.	119.1	17
1880	N.	103.7	21	N.E.	127.6	26	N.E.	116.8	17	S.W.	135.8	23	S.W.	113.2	19	S.W.	106.2	14
1881	N.E.	105.1	17	N.E.	159.4	33	N.E.	136.2	46	W.	126.5	24	W.	139.6	19	W.	140.6	20
1882	N.E.	152.0	48	N.E.	139.2	30	W.	142.9	30	W.	92.9	30	W.	125.1	26	W.	137.5	18
1883	N.E.	178.2	34	N.E.	161.4	28	W.	124.3	22	W.	171.2	42	W.	157.1	24	W.	129.9	21
1884	N.E.	166.6	24	N.E.	189.1	40	N.E.	183.3	30	W.	150.4	24	W.	129.9	18	W.	128.4	20
1885	N.E.	136.3	20	N.E.	134.6	26	W.	114.9	20	W.	143.7	28	W.	102.9	23	W.	124.8	21
1886	E.	168.6	37	N.E.	143.2	29	W.	146.9	25	W.	150.9	28	W.	138.2	20	W.	126.2	17
1887	N.E.	141.5	24	S.E.	189.3	32	W.	123.3	18	W.	136.2	37	W.	151.8	30	W.	148.1	20
1888	E.	142.1	33	W.	121.2	23	W.	149.1	30	W.	138.5	28	W.	137.8	24	W.	136.1	19

Year.	July.			August.			September.			October.			November.			December.			Annual.		
	Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.		Direction.	Velocity.	
		Av.	Max.		Av.	Max.		Av.	Max.		Av.	Max.		Av.	Max.		Av.	Max.		Av.	Max.
1877	W.	104.1	13	W.	93.9	16	W.	107.9	12	W.	111.1	24	N.	111.8	24	N.	119.5	24	W.	108.0	24
1878	W.	103.2	15	W.	98.4	15	W.	101.2	16	W.	92.5	14	N.	109.8	21	N.E.	126.0	23	N. & W.	112.6	26
1879	W.	106.3	14	W.	98.7	14	W.	92.3	15	N.E.	114.5	23	N.E.	101.7	24	N.E.	109.3	27	N.E.	111.2	29
1880	S.W.	108.9	22	S.W.	102.5	19	S.W.	89.8	14	S.W.	78.2	16	N.E.	63.9	17	N.E.	77.5	22	S.W.	102.0	26
1881	W.	136.8	19	W.	128.8	21	W.	131.3	24	W.	124.1	24	S.W.	175.3	43	W.	131.9	26	W.	136.3	46
1882	S.W.	134.2	18	W.	131.3	17	W.	130.1	28	W.	137.6	28	N.N.E.	130.7	20	N.E.	141.4	28	W.	132.9	48
1883	W.	131.0	16	W.	126.6	17	W.	126.0	20	W.	146.6	26	N.E.	132.9	16	N.E.	141.6	28	W.	143.9	42
1884	W.	102.1	18	W.	119.2	20	W.	119.4	18	W.	119.6	24	W.	109.5	14	N.E.	139.8	34	W.	138.1	40
1885	W.	101.6	20	W.	99.9	22	W.	85.4	18	W.	81.1	17	E.S.E.	156.7	26	N.E.	158.6	36	W.	120.0	36
1886	W.	130.2	22	W.	121.3	18	W.	112.5	16	W.	131.5	24	N.E.	148.9	30	N.E.	118.4	20	W.	136.4	37
1887	W.	128.2	20	W.	130.0	18	W.	124.9	23	W.	136.1	34	W.	122.3	18	N.E.	153.9	37	W.	140.5	37
1888	W.	133.4	21	W.	124.2	18	W.	117.3	23	W.	109.9	18	N.E.	70.9	18	W.	87.1	26	W.	122.4	33

The average annual direction is west; average daily movement, 125.6 miles, and average hourly velocity, 5.2 miles.

Table Showing the Number of Days in each Month and each Year the Temperature was above Ninety Degrees and below Thirty-two Degrees, at Los Angeles.

Year:	1877	1878	1879	1880	1881	1882	1883	1884	1885	1886	1887	1888
January—Above 90°	....	0	0	0	0	0	0	0	0	0	0	0
Below 32°	....	0	0	1	0	0	1	0	0	0	0	4
February—Above 90°	....	0	0	0	0	0	0	0	0	0	0	0
Below 32°	....	0	0	0	0	0	2	0	0	0	0	0
March—Above 90°	....	0	1	0	0	0	0	0	0	0	0	0
Below 32°	....	0	0	0	0	0	0	0	0	0	0	0
April—Above 90°	....	0	0	0	1	0	0	0	0	0	0	2
Below 32°	....	0	0	0	0	0	0	0	0	0	0	0
May—Above 90°	....	0	2	1	0	0	3	0	0	0	2	0
Below 32°	....	0	0	0	0	0	0	0	0	0	0	0
June—Above 90°	....	0	3	0	0	0	6	2	1	4	2	3
Below 32°	....	0	0	0	0	0	0	0	0	0	0	0
July—Above 90°	3	0	0	0	5	3	0	5	7	9	3	6
Below 32°	0	0	0	0	0	0	0	0	0	0	0	0
August—Above 90°	0	0	2	0	4	5	8	7	11	13	3	8
Below 32°	0	0	0	0	0	0	0	0	0	0	0	0
September—Above 90°	1	4	4	1	7	2	10	1	5	1	2	9
Below 32°	0	0	0	0	6	0	0	0	0	0	0	0
October—Above 90°	0	1	6	0	0	0	0	0	2	0	5	2
Below 32°	0	0	0	0	0	0	0	0	0	0	0	0
November—Above 90°	0	0	0	0	0	0	0	0	0	0	0	0
Below 32°	0	0	0	0	0	0	0	0	0	0	0	0
December—Above 90°	0	0	0	0	0	0	0	0	0	0	0	0
Below 32°	0	1	1	0	0	0	0	0	0	0	0	0
Annual—Above 90°	4	5	18	2	17	10	27	15	26	27	17	30
Below 32°	0	1	1	1	1	0	3	0	0	0	0	4

Table Showing the Monthly and Annual Mean Relative Humidity and Averages, at Los Angeles.

Year.	January	February	March	April	May	June	July	August	September	October	November	December	Annual
1877	.....	.....	.....	.....	.....	.....	63.9	63.4	63.5	66.9	45.3	57.4	60.1
1878	61.7	69.9	73.9	71.3	71.7	72.8	70.9	70.3	62.2	60.4	58.5	48.1	66.0
1879	64.0	73.9	71.0	65.2	62.3	65.3	69.6	68.4	81.2	53.2	71.2	70.9	68.0
1880	64.3	66.9	76.1	73.1	73.0	66.9	74.2	74.0	71.3	65.0	56.3	70.9	69.3
1881	64.8	62.9	65.3	71.2	70.0	68.6	67.4	68.8	66.8	70.4	51.2	64.1	66.0
1882	69.6	63.5	65.1	71.9	65.8	68.5	67.2	66.4	66.9	63.1	59.0	54.8	65.2
1883	52.8	60.6	80.1	68.2	71.7	72.5	72.8	71.1	66.9	69.2	59.5	68.3	67.4
1884	61.9	71.1	76.0	79.4	76.1	75.5	72.4	72.6	72.5	71.8	71.2	77.2	73.1
1885	65.2	66.3	65.6	69.6	75.3	68.9	71.0	69.8	75.9	77.9	77.7	71.6	71.2
1886	77.8	75.5	80.9	80.1	74.5	75.9	72.8	77.2	81.6	80.0	67.1	79.1	76.9
1887	66.3	81.5	78.5	78.9	72.9	78.5	82.7	80.9	82.0	72.7	78.1	74.4	77.3
1888	80.1	83.2	77.7	75.2	79.2	74.1	75.6	79.4	77.7	82.4	74.1	71.0	77.5
Av'ages	66.2	70.5	73.6	73.1	72.0	71.6	71.7	71.9	72.4	69.4	64.1	67.3	69.9

The following table shows the number of clear, fair, and cloudy days in each month and each year, with averages. It will be observed that the average annual number of clear days is 180; fair days, 137; and the average annual number of cloudy days is but 48; showing an average of 317 days on which the sun shone brightly or was but partially obscured, at Los Angeles:

Table Showing the Number of Clear, Fair, and Cloudy Days in Each Month, and Each Year, with Averages.

Month.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	Average.
January—Clear	-----	13	16	20	17	18	21	17	*17	13	21	14	17
Fair	-----	10	10	10	9	6	6	8	*10	6	10	8	8
Cloudy	-----	8	5	1	5	7	4	6	3	12	0	9	6
February—Clear	----	13	6	16	14	16	13	11	16	20	13	14	14
Fair	-----	6	13	8	12	9	9	8	11	4	9	8	9
Cloudy	-----	9	9	5	2	3	6	10	1	4	6	7	5
March—Clear	-----	7	16	16	15	15	6	9	14	14	18	10	13
Fair	-----	18	5	10	13	5	14	11	12	11	12	12	11
Cloudy	-----	6	10	5	3	11	11	11	5	6	1	9	7
April—Clear	-----	8	13	8	6	16	10	11	11	13	11	14	11
Fair	-----	13	12	10	13	9	18	13	12	10	10	8	12
Cloudy	-----	9	5	12	11	5	2	7	7	7	9	8	7
May—Clear	-----	11	22	15	9	12	12	7	4	14	14	5	11
Fair	-----	10	9	11	15	11	15	16	21	14	*11	18	14
Cloudy	-----	10	0	5	7	8	4	8	6	3	5	8	6
June—Clear	-----	3	3	7	12	11	15	8	15	*10	17	17	11
Fair	-----	15	24	22	16	14	12	9	14	*16	10	12	15
Cloudy	-----	12	3	1	2	5	3	13	1	3	3	1	4
July—Clear	19	5	23	5	11	9	11	24	14	15	13	17	13
Fair	11	26	18	23	19	22	19	7	16	14	13	13	17
Cloudy	1	0	0	3	1	0	1	0	1	2	5	1	1
August—Clear	22	10	17	12	12	*16	20	23	16	21	11	23	*17
Fair	8	19	14	16	18	*6	10	8	14	8	20	8	*12
Cloudy	1	2	0	3	1	1	1	0	1	2	0	0	*1
September—Clear	16	15	18	6	17	26	22	20	18	15	15	21	18
Fair	11	14	12	23	11	2	8	8	12	15	12	7	11
Cloudy	3	1	0	1	2	2	0	2	0	0	3	2	1
October—Clear	18	17	19	9	19	20	13	25	21	15	24	16	18
Fair	11	13	9	16	9	9	14	4	10	14	6	10	10
Cloudy	2	1	3	6	3	2	4	2	0	2	1	5	3
November—Clear	22	17	17	17	25	16	18	21	14	22	18	15	18
Fair	7	11	10	12	5	8	11	7	8	7	9	8	9
Cloudy	1	2	3	1	0	6	1	2	8	1	3	7	3
December—Clear	18	22	13	10	15	22	22	*13	21	18	21	18	18
Fair	7	4	10	10	14	8	7	*11	5	12	7	6	8
Cloudy	6	5	8	11	2	1	2	6	5	1	3	7	5
Annual—Clear	115	141	173	141	172	197	183	189	181	190	196	184	180
Fair	55	159	146	171	154	109	143	110	145	131	129	118	136
Cloudy	14	65	46	54	39	51	39	66	38	43	39	64	49

*Record incomplete.

Precipitation, Including Deposit from Fog and Dew, in Inches and Hundredths.—Table Showing the Monthly, Annual, and Average Precipitation, at Los Angeles.

Year.	Jan.	Feb.	March.	April.	May	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	An'ual.
1877	------	------	------	------	------	------	.00	.00	.00	.86	.45	3.93	5.24
1878	3.33	7.68	2.57	1.71	.66	.07	.00	.00	.00	.14	.00	4.70	20.86
1879	3.59	.97	.49	1.19	.24	.03	.00	.00	.00	.93	3.44	6.53	17.41
1880	1.33	1.56	1.45	5.06	.04	.00	T.	T.	.00	.14	.67	8.40	18.65
1881	1.43	.36	1.66	.46	.01	.00	.00	T.	T.	.82	.27	.52	5.53
1882	1.01	2.66	2.66	1.83	.63	T.	.00	.00	T.	.05	1.82	.08	10.74
1883	1.62	3.47	2.87	.15	2.02	.03	T.	.00	.00	1.42	.00	2.56	14.14
1884	3.15	13.37	12.36	3.58	.39	1.39	.02	.02	T.	.39	1.07	4.65	40.39
1885	1.05	.01	.01	2.01	.06	T.	T.	T.	.05	.30	5.55	1.65	10.69
1886	7.78	1.41	2.52	3.32	.01	.11	.27	.21	.11	.02	1.18	.26	17.20
1887	.20	9.25	.29	2.36	.20	.07	.07	T.	.18	.17	.80	2.68	16.27
1888	6.04	.80	3.17	.12	.05	.01	.04	.10	.03	.40	4.02	6.26	21.04
Ave'ges	2.78	3.78	2.73	1.98	.39	.16	.03	.03	.03	.47	1.61	3.12	16.51

RAINFALL AT LOS ANGELES, LOS ANGELES COUNTY.

The following figures, from February, 1872, to June, 1877, are from the records of Mr. C. Duycommun, of Los Angeles; from July, 1877, to date, from Signal Office records:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1872	------	2.25	.43	.97	.10	none	none	.22	none	none	none	4.42	8.39	1872–73	13.96
1873	2.08	7.19	.05	none	none	none	none	1.06	none	none	.74	5.74	16.86	1873–74	24.78
1874	5.51	9.77	1.09	.45	.42	none	none	none	.06	1.81	1.89	.20	21.20	1874–75	21.67
1875	17.22	.15	.22	.07	.05	none	none	none	none	none	7.57	.82	26.10	1875–76	26.74
1876	6.54	7.92	3.41	.45	.03	none	none	none	none	.40	none	none	18.75	1876–77	5.28
1877	3.48	.01	.83	.26	.30	none	none	none	none	.86	.45	3.93	10.12	1877–78	21.26
1878	3.33	7.68	2.57	1.71	.66	.07	none	none	none	.14	none	4.70	20.86	1878–79	11.35
1879	3.59	.97	.49	1.19	.24	.03	none	none	none	.93	3.44	6.53	17.41	1879–80	20.34
1880	1.33	1.56	1.45	5.06	.04	none	sprin.	sprin.	none	.14	67	8.40	18.65	1880–81	13.13
1881	1.43	.36	1.66	.46	.01	none	none	sprin.	sprin.	.82	.27	.52	5.53	1881–82	10.40
1882	1.01	2.66	2.66	1.83	.63	sprin.	none	none	sprin.	.05	1.82	.08	10.74	1882–83	12.11
1883	1.62	3.47	2.87	.15	2.02	.03	sprin.	none	none	1.42	none	2.56	14.14	1883–84	38.22
1884	3.15	13.37	12.36	3.58	.39	1.39	.02	.02	sprin.	.39	1.07	4.65	40.39	1884–85	9.29
1885	1.05	.01	.01	2.01	.06	sprin.	sprin.	sprin.	.05	.30	5.55	1.65	10.69	1885–86	22.72
1886	7.78	1.41	2.52	3.32	.01	.11	.27	.21	.11	.02	1.18	.26	17.22	1886–87	14.42
1887	.20	9.25	.29	2.36	.20	.07	.07	sprin.	.18	.17	.80	2.68	16.07	1887–88	14.09
1888	6.04	.80	3.17	.12	.05	.01	.04	.10	.03	.40	4.02	6.26	21.04	1888–89	*10.85

*Up to January 1, 1889.

The following table shows the number of days on which .01 of an inch or more precipitation occurred, excluding fog and dew:

Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	An'ual.
1877	.....	.....	.....	.....	.....	.....	0	0	0	2	1	0	3
1878	7	10	9	7	10	4	0	0	0	3	0	4	54
1879	9	7	6	6	2	2	0	0	0	3	3	10	48
1880	5	8	6	13	1	0	0	0	0	2	3	13	51
1881	3	4	5	4	1	0	0	0	0	3	2	2	24
1882	6	5	10	6	3	0	0	0	0	4	3	2	39
1883	3	4	7	3	6	2	0	0	0	2	0	6	33
1884	5	14	18	9	4	6	0	0	0	2	3	10	71
1885	2	0	1	8	1	0	0	0	0	1	9	4	26
1886	10	2	8	4	0	1	1	1	0	1	1	3	32
1887	2	13	2	5	3	1	2	0	1	1	3	4	37
1888	9	5	11	3	1	0	1	1	0	3	8	6	48
Av'ges	6	7	8	6	3	2	3	2	1	2	3	5	42

Table showing the precipitation by seasons, and the beginning and ending of the rainy season at Los Angeles:

Precipitation by Seasons.

1878–79	11.35	1884–85	9.25
1879–80	20.34	1885–86	22.58
1880–81	13.13	1886–87	13.76
1881–82	10.40	1887–88	14.01
1882–83	12.11	1888–89	*10.68
1883–84	38.22		

* Precipitation for 1888–89 is from October to December, 1888.

Beginning and Ending of Rainy Season at Los Angeles.

Year.	Began.	Ended.
1878–79	December 28, 1878	June 16, 1879.
1879–80	October 12, 1879	May 11, 1880.
1880–81	October 8, 1880	May 16, 1881.
1881–82	October 25, 1881	May 25, 1882.
1882–83	October 1, 1882	June 11, 1883.
1883–84	October 4, 1883	June 21, 1884.
1884–85	October 9, 1884	May 11, 1885.
1885–86	October 16, 1885	April 13, 1886.
1886–87	October 10, 1886	May 31, 1887.
1887–88	September 21, 1887	May 4, 1888.
1888–89	October 17, 1888.	

Note.—Showers of rain occurred in July and August, 1886, aggregating .45 of an inch, and light showers fell in June and July, 1888.

The following table shows the seasonal and annual averages as deduced from the foregoing data, and will be valuable as showing the yearly characteristic of the Los Angeles climate:

	Winter.	Spring.	Summer.	Autumn.	Annual.
Mean average temperature	54.1	58.9	68.0	62.7	61.0
Mean average humidity	68.0	72.9	71.7	68.6	70.3
Mean average number of clear days	49	35	41	54	180
Mean average number of fair days	25	37	44	30	136
Mean average number of cloudy days	16	20	6	7	49
Prevailing direction of wind	N.E.	W.	W.	W.	W.
Mean average daily velocity of wind	138.5	133.0	116.9	120.6	125.6

Average annual precipitation, 16.10 inches.
Average seasonal precipitation, 16.52 inches.
Average annual number of days on which an appreciable rain fell, 42.
Average beginning of rainy season is in October, and average ending in May.

Riverside Weather—Comparison of Climates.

From the "Riverside Press," 1888.

The report of the State Board of Health, just received, furnishes a great amount of readable matter upon a variety of topics relating to health conditions. Opening at random, we find a table of temperatures at prominent health resorts, from which we select a few for comparison with California towns. The following table gives the mean temperatures of the seasons and the mean annual temperature:

	Winter.	Spring.	Summer.	Autumn.	Mean Annual Temp.
Madeira	60.6	62.4	69.6	67.3	65.0
Palermo	53.1	59.3	74.7	66.8	64.4
St. Michael's (Azores)	57.8	61.2	68.3	62.3	62.4
Naples	48.5	58.5	70.8	64.5	61.4
Nice	47.8	56.2	72.3	61.6	59.5
Florence	44.3	56.0	74.0	60.7	59.0
Red Bluff, California	46.8	59.8	79.7	63.2	62.4
Auburn	46.2	56.4	74.3	61.7	59.7
Oroville	52.0	64.5	78.8	64.3	64.9
Fresno	50.2	64.9	84.1	67.6	66.7
Los Angeles	53.6	58.4	67.8	62.7	60.6
Riverside	50.4	64.1	73.7	65.7	63.5
San Diego	54.6	58.1	66.8	62.6	60.5

The above would seem to indicate that in the main the temperatures do not differ materially, and yet it is well known that a table giving merely the mean temperature of a locality conveys very little idea of what the climate really is. To illustrate:

	Highest Temp.	Lowest Temp.	Annual Rainfall.
Red Bluff	110	16	27.46
Oroville	102	20	22.11
Auburn	106	13	33.15
Fresno	115	18	9.57
Los Angeles	102	28	17.64
Riverside	105	25	8.16
San Diego	101	32	11.01

Another thing which these tables show, and this is something of interest to the health-seeker. It is constantly urged that the central portion of the State is a more agreeable climate. We admit that it has features which are more attractive, but they are features due to conditions which the man with delicate lungs or the rheumatic patient would do well to consider. The greater prevalence of natural woods adds greatly to the beauty of the scenery, which is often heightened by the undulating character of much of the country in what is called their "thermal belt." The greater number of live oaks and other wild trees indicate a moister climate, and the hilly lands best adapted to fruit growing are expensive to irrigate. The second table fully confirms the idea of a moister climate, if we were not convinced by the indications nature gives of the fact in the more common growth of forest trees. Compare the rainfall of Riverside, 8.16 inches, and Colton, 9.84 inches, with Auburn, 33.15 inches, and Oroville's 22.11 inches. It will appear that where there is one rainy day in Riverside in winter there are over four at Auburn, and nearly three at Oroville. Here is a point for delicate people to study who are looking over this State with a view to settlement. The advantage which California's climate offers over that of the East is not simply its absence of severe cold, but rather the smaller amount of stormy weather which makes almost constant out-of-door life possible. Nowhere at any desirable point in the State can be found a spot where there are fewer rainy days in the year than in Riverside, and this is why it has become so popular a resort for people with delicate lungs, or with rheumatic troubles. It is this peculiarity which gives and always will give Southern California the advantage over the northern part of the State as a place for residence, at least for delicate people.

From the second table it will be seen that there are reasons shown why Riverside—and this applies equally to all this great San Bernardino Valley—is better adapted to orange and lemon growing than the points at the north where they are now so energetically planting citrus trees. Oroville has an annual mean temperature a little higher than Riverside, and yet the record shows that the mercury dropped last season 5° lower than it did here, and remained at the low point longer, and we know how dangerous a temperature even 25° is to oranges and lemons. Red Bluff shows a record of 16° and Auburn 13° above, both low enough to ruin all citrus fruits, and the latter figure a dangerous one even to the olive. Fresno, whose hot, dry climate has proved so admirably adapted to raisin making, shows a record of 115° in summer, but drops far below the danger point to oranges, 18° in winter.

Riverside is confessedly the most successful orange-growing section in the State, and yet her experienced growers know how anxious they are when the mercury gets as low as 28°, and that 6° lower than that means the loss of much of the crop. But that difference is just about the advantage this section has over points now selected for orange growing at the north. It is just this greater security to our crops that makes our climate so much to be preferred by those who desire to engage in orange growing, and it is this one item alone which gives much greater value to land in Southern California, which is in hardly any other respect superior.

"Riverside Press" Signal Service Weather Record.

The following shows the highest and lowest temperature, and the average temperature, humidity, and barometer, along with the prevailing direction of wind for each day of each month during the year 1888, at Riverside, California, from the "Riverside Press:"

Date	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
January 1	56.0	30.5	43.3	64.7	30.09	N.W.
January 2	64.0	33.0	48.5	67.1	30.02	W.
January 3	54.5	37.0	45.7	85.0	29.78	S.E.
January 4	54.0	45.5	49.8	79.4	29.64	S.E.
January 5	47.0	36.5	41.8	86.8	29.74	S.E.
January 6	51.0	36.0	43.5	78.0	29.87	S.W.
January 7	46.5	32.0	39.3	66.4	30.00	E.
January 8	47.0	25.5	36.3	59.7	30.00	N.E.
January 9	42.5	34.0	38.3	57.9	30.01	N.
January 10	49.0	32.0	40.5	61.8	30.05	N.E.
January 11	57.0	38.0	47.5	74.1	30.11	N.W.
January 12	54.0	32.0	43.0	80.1	30.13	N.E.
January 13	56.5	37.0	46.8	81.9	30.02	S.W.
January 14	51.0	36.0	43.5	60.3	30.04	N.
January 15	49.0	27.5	38.3	61.1	30.07	N.E.
January 16	51.5	25.5	38.5	66.2	30.12	S.W.
January 17	55.0	30.0	42.5	60.4	30.32	N.
January 18	55.0	36.0	45.5	55.1	30.26	N.E.
January 19	59.0	36.0	47.5	71.5	29.96	N.E.
January 20	54.0	44.0	49.0	96.4	29.93	E.
January 21	63.0	47.5	55.3	89.0	30.02	E.
January 22	65.0	48.5	56.8	82.8	29.94	W.
January 23	66.0	54.0	60.0	81.3	30.06	S.W.
January 24	65.0	53.0	59.0	81.7	30.09	W.
January 25	71.0	42.5	56.8	72.9	30.11	N.E.
January 26	74.0	40.5	57.3	75.3	30.08	N.E.
January 27	62.0	42.0	52.0	82.1	30.06	W.
January 28	65.0	43.0	54.0	85.0	30.03	N.E.
January 29	66.0	41.5	53.8	83.5	30.01	S.W.
January 30	65.0	42.0	53.5	82.9	29.99	N.E.
January 31	58.0	48.0	53.0	82.5	29.96	S.W.
February 1	64.0	48.0	56.0	84.4	29.98	S.W.
February 2	60.0	38.0	49.0	78.1	29.99	E.
February 3	60.0	33.0	46.5	78.9	29.90	W.
February 4	63.0	43.0	53.0	79.5	29.90	S.W.
February 5	64.0	36.0	50.0	73.8	29.90	E.
February 6	65.0	38.5	51.8	67.2	29.91	N.
February 7	64.0	37.0	50.5	78.8	29.90	S.W.
February 8	65.0	36.0	50.5	74.9	29.91	S.W.
February 9	55.0	40.0	47.5	83.2	29.93	S.W.
February 10	57.0	48.0	52.5	82.9	29.95	W.
February 11	69.0	47.0	58.0	83.7	29.99	W.
February 12	67.0	40.0	53.5	77.9	29.99	S.W.
February 13	69.0	48.0	58.5	82.4	29.94	S.W.
February 14	61.0	48.0	54.5	81.7	29.96	N.W.
February 15	52.0	44.0	53.0	81.8	30.00	W.
February 16	56.0	49.0	52.5	86.4	30.06	N.W.
February 17	57.0	46.0	51.5	86.3	30.10	W.
February 18	58.0	49.0	52.5	80.5	30.07	W.
February 19	66.0	46.0	56.5	58.5	29.94	N.
February 20	64.0	36.0	53.1	48.1	29.87	N.
February 21	67.0	51.0	58.2	41.5	29.86	N.
February 22	71.0	53.0	58.5	52.3	29.99	N.
February 23	71.0	39.5	52.8	61.3	30.04	W.
February 24	74.0	38.0	53.8	67.7	30.03	S.W.
February 25	76.5	39.0	56.8	70.5	30.03	W.
February 26	78.0	41.0	57.8	58.1	29.99	S.
February 27	74.5	44.0	59.0	65.5	29.91	W.
February 28	64.0	49.0	54.5	84.6	29.81	S.W
February 29	51.0	42.0	45.3	82.9	29.67	W.

Rainfall for January, 4.17 inches. Rainfall for February, .90 inch.

RIVERSIDE SIGNAL SERVICE WEATHER RECORD—Continued.

DATE.	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
March 1	59.0	32.0	44.8	75.4	29.94	N.E.
March 2	54.0	33.0	46.0	83.8	29.90	S.E.
March 3	57.0	39.0	47.3	78.0	29.96	S.E.
March 4	55.0	36.0	48.0	78.3	30.02	S.W.
March 5	61.0	42.0	59.0	81.4	30.01	W.
March 6	65.5	35.0	51.5	77.3	29.94	W.
March 7	62.0	46.5	44.5	87.5	29.79	N.E.
March 8	60.0	49.0	53.8	92.2	29.74	S.E.
March 9	58.5	46.0	49.5	82.3	30.00	S.W.
March 10	65.5	36.0	50.5	80.3	30.13	S.E.
March 11	74.0	37.0	55.0	66.6	30.15	N.W.
March 12	73.5	39.0	55.3	65.0	30.14	N.E.
March 13	72.5	41.0	56.8	68.2	30.03	W.
March 14	64.0	45.0	56.5	83.3	29.87	S.W.
March 15	65.0	52.0	53.3	81.3	29.90	N.E.
March 16	75.0	42.0	55.0	78.6	29.90	S.W.
March 17	71.0	48.0	57.5	79.2	29.86	S.W.
March 18	60.5	52.0	56.0	82.9	29.82	S.W.
March 19	68.0	52.0	55.8	77.9	29.86	N.W.
March 20	69.0	42.5	54.5	79.8	29.98	W.
March 21	76.0	43.5	55.8	75.5	30.00	N.W.
March 22	74.0	45.0	56.5	75.5	29.92	S.W.
March 23	66.0	52.0	57.3	77.7	29.87	W.
March 24	64.0	50.0	54.5	76.1	29.82	W.
March 25	68.0	46.0	56.5	75.9	29.77	N.W.
March 26	64.0	48.0	54.5	79.3	29.77	N.E.
March 27	66.0	39.0	50.3	62.6	29.93	N.
March 28	70.0	36.0	53.8	75.6	30.00	W.
March 29	71.0	44.0	55.3	78.7	30.00	S.W.
March 30	67.0	43.0	54.8	79.7	30.00	W.
March 31	71.0	46.0	57.0	77.9	30.10	S.W.
April 1	72.5	42.0	56.2	77.2	30.06	S.W.
April 2	75.0	49.0	57.8	73.9	30.00	W.
April 3	73.0	42.0	55.0	78.8	29.88	S.W.
April 4	71.0	44.0	52.0	68.2	29.95	S.W.
April 5	72.5	38.0	56.0	75.1	30.03	S.W.
April 6	77.0	42.0	60.5	79.9	30.05	N.W.
April 7	74.0	48.0	57.5	75.9	30.02	S.W.
April 8	76.0	42.5	73.5	56.0	30.01	N.W.
April 9	78.0	44.0	59.5	57.5	29.96	N.W.
April 10	85.0	52.0	64.5	64.8	29.98	W.
April 11	93.0	48.0	66.2	59.7	30.00	N.W.
April 12	97.5	49.0	75.0	58.1	29.96	N.E.
April 13	96.0	53.0	74.5	41.9	29.92	N.E.
April 14	86.0	57.0	68.5	68.3	29.93	S.W.
April 15	76.0	59.5	66.5	75.9	29.94	W.
April 16	71.0	56.5	61.0	78.6	29.88	S.W.
April 17	67.0	55.0	60.0	80.9	29.88	W.
April 18	72.0	56.0	60.5	79.0	29.93	S.E.
April 19	82.0	52.0	65.5	75.9	29.89	W.
April 20	76.0	58.0	66.5	70.2	29.89	W.
April 21	74.0	58.0	65.5	81.6	29.91	S.W.
April 22	76.0	58.0	66.5	75.8	29.93	N.W.
April 23	73.0	58.0	64.5	78.9	29.96	N.W.
April 24	69.0	56.0	61.5	75.2	29.94	N.W.
April 25	69.0	46.0	57.5	72.2	29.90	S.W.
April 26	73.0	39.0	57.5	56.6	29.92	S.W.
April 27	78.0	42.0	60.0	59.7	30.00	W.
April 28	89.0	48.0	68.0	59.6	30.00	N.W.
April 29	89.0	52.0	71.0	63.7	29.95	S.W.
April 30	82.0	53.0	67.0	62.8	29.87	S.W.

Rainfall for March, 3.51 inches. Rainfall for April, .15 inch.

RIVERSIDE SIGNAL SERVICE WEATHER RECORD—Continued.

DATE.	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
May 1	68.0	56.0	59.5	73.9	29.86	S.W.
May 2	74.0	52.5	60.0	73.7	29.87	S.W.
May 3	74.0	53.5	61.0	76.1	29.89	N.W.
May 4	72.0	54.0	63.0	77.6	29.87	W.
May 5	74.0	56.0	65.0	73.2	29.90	N.W.
May 6	75.0	56.5	62.0	69.7	29.93	W.
May 7	73.0	52.5	61.0	76.1	29.96	S.W.
May 8	76.0	53.0	62.0	75.6	30.00	S.W.
May 9	76.5	52.0	61.5	72.3	29.97	W.
May 10	79.0	53.0	62.0	73.4	29.81	W.
May 11	82.0	53.0	66.5	75.9	29.77	W.
May 12	83.0	56.0	66.0	76.2	29.83	S.W.
May 13	85.0	52.0	67.0	64.8	29.86	W.
May 14	81.0	56.0	64.5	69.4	29.88	S.W.
May 15	75.0	54.0	62.0	76.1	29.88	N.W.
May 16	73.0	55.0	61.5	69.9	29.86	W.
May 17	78.9	52.5	63.0	68.2	29.85	S.W.
May 18	78.0	55.0	64.0	75.3	29.81	W.
May 19	79.0	58.0	64.5	73.5	29.85	W.
May 20	74.0	56.0	62.0	69.0	29.84	N.W.
May 21	73.5	54.0	61.0	69.1	29.84	W.
May 22	72.0	54.0	60.0	68.3	29.85	S.W.
May 23	74.0	53.0	59.0	65.6	29.88	W.
May 24	74.0	49.0	62.5	63.0	29.88	S.W.
May 25	74.0	48.0	61.5	58.4	29.88	W.
May 26	72.0	49.0	61.5	62.0	29.89	S.W.
May 27	78.0	45.5	63.0	60.5	29.90	W.
May 28	85.0	47.0	70.0	62.2	29.87	W.
May 29	84.5	55.0	71.0	59.7	29.84	S.W.
May 30	85.0	53.0	71.0	56.9	29.82	S.W.
May 31	86.0	61.0	72.0	54.9	29.83	S.W.
June 1	82.0	58.0	69.5	60.1	29.91	S.W.
June 2	80.0	55.0	69.0	65.2	29.90	W.
June 3	80.0	54.5	67.0	59.7	29.88	W.
June 4	82.0	49.0	65.0	57.2	29.85	S.W.
June 5	85.0	49.0	66.5	64.9	29.77	W.
June 6	80.0	52.0	65.0	63.7	29.77	N.W.
June 7	82.0	49.0	69.5	52.8	29.81	W.
June 8	94.0	48.0	75.5	43.2	29.82	S.W.
June 9	88.0	52.0	72.0	52.4	29.82	W.
June 10	90.0	51.0	73.0	50.3	29.85	S.W.
June 11	92.5	52.0	75.5	40.9	29.85	S.W.
June 12	89.0	56.0	73.5	45.0	29.84	N.W.
June 13	88.0	56.0	74.0	53.9	29.82	W.
June 14	90.0	57.5	75.5	46.6	29.85	W.
June 15	89.0	54.5	75.5	55.2	29.85	N.W.
June 16	88.0	56.0	74.5	55.4	29.84	W.
June 17	78.0	58.0	67.5	61.5	29.84	S.W.
June 18	80.0	53.5	70.5	60.3	29.81	S.W.
June 19	83.0	53.0	71.5	57.7	29.80	W.
June 20	94.0	52.0	76.5	54.9	29.79	W.
June 21	95.0	58.0	78.0	49.5	29.77	N.W.
June 22	88.0	59.0	74.5	62.7	29.79	W.
June 23	87.0	62.0	71.5	59.4	29.83	W.
June 24	85.0	60.0	71.0	65.6	29.81	N.W.
June 25	84.0	60.5	71.5	69.5	29.80	W.
June 26	83.5	61.0	72.0	71.5	29.90	W.
June 27	82.0	61.0	72.0	65.9	29.90	W.
June 28	82.0	63.0	72.5	67.3	29.88	N.W.
June 29	84.0	63.0	73.0	59.1	29.91	S.W.
June 30	84.0	57.0	72.0	60.0	29.91	S.W.

Rainfall for May, .04 inch.

RIVERSIDE SIGNAL SERVICE WEATHER RECORD—Continued.

DATE.	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
July 1	94.0	53.0	74.8	43.7	29.88	N.
July 2	91.0	57.0	73.0	64.1	29.77	S.W.
July 3	93.0	59.0	77.2	52.7	29.82	S.W.
July 4	95.5	64.0	80.5	37.5	29.88	S.
July 5	95.0	62.0	80.5	45.0	29.91	S.
July 6	92.0	58.0	76.8	44.3	29.90	S.
July 7	89.0	60.0	77.2	58.5	29.85	S.
July 8	91.0	53.0	73.0	60.1	29.94	S.W.
July 9	94.0	53.5	78.5	57.5	29.90	S.
July 10	90.5	60.5	73.5	67.0	29.82	S.
July 11	91.0	66.0	76.8	62.3	29.83	S.
July 12	88.0	44.0	73.0	44.2	29.93	S.W.
July 13	95.0	48.0	74.5	48.2	29.94	S.W.
July 14	98.5	55.0	80.5	48.8	29.93	N.W.
July 15	100.5	60.5	84.0	46.7	29.89	W.
July 16	95.0	63.5	83.8	48.8	29.87	W.
July 17	95.5	63.5	81.3	52.5	29.87	S.W.
July 18	96.0	63.0	82.0	49.4	29.89	W.
July 19	98.5	64.0	82.0	48.1	29.93	W.
July 20	100.0	71.0	83.8	48.1	30.01	N.W.
July 21	100.0	66.0	86.2	46.1	30.00	S.W.
July 22	98.0	65.0	84.0	50.9	29.97	W.
July 23	94.5	63.0	82.5	52.6	29.92	W.
July 24	91.5	63.0	79.2	58.2	29.89	S.W.
July 25	91.5	62.0	77.8	61.0	29.90	S.W.
July 26	95.0	59.0	81.5	55.7	29.89	W.
July 27	95.0	59.0	80.5	54.0	29.86	W.
July 28	92.0	58.0	77.0	66.1	29.85	S.W.
July 29	94.0	57.0	79.5	55.9	29.87	S.W.
July 30	89.0	61.0	76.0	63.2	29.89	W.
July 31	87.0	62.0	74.5	69.8	29.88	W.
August 1	90.5	55.0	75.5	54.1	29.93	S.W.
August 2	91.5	51.0	74.0	53.0	29.93	S.W.
August 3	96.0	59.0	78.0	49.5	29.92	W.
August 4	97.0	56.0	80.0	53.0	29.90	S.W.
August 5	97.0	57.5	79.5	42.1	29.88	N.W.
August 6	96.0	56.0	81.0	47.5	29.87	S.W.
August 7	95.5	58.0	79 8	52.2	29.90	S.W.
August 8	95.0	58.0	78.0	58.0	29.88	W.
August 9	94.0	58.0	78.5	53.7	29.85	S.W.
August 10	99.0	57.5	83.0	43.0	29.86	N.W.
August 11	102.5	58.5	85.7	44.3	29.91	W.
August 12	100.0	66.0	84.5	46.7	29.91	S.W.
August 13	102.5	64.0	85.0	48.5	29.89	S.W.
August 14	98.0	64.0	82.3	50.9	29.83	N.W.
August 15	88.0	66.0	77.0	61.2	29.80	S.W.
August 16	86.0	64.0	74.5	55.9	29.89	W.
August 17	86.5	60.0	76.0	62.7	29.93	W.
August 18	90.0	51.0	74.2	52.2	29.99	S.W.
August 19	93.0	58.0	79.5	48.5	29.96	S.W.
August 20	91.0	56.0	75.0	48.1	29.90	N.
August 21	90.0	55.5	74.0	62.1	29.85	W.
August 22	96.0	58.0	81.8	55.3	29.84	S.W.
August 23	97.0	59.0	78.5	58.7	29.84	W.
August 24	95.0	61.0	78.8	61.8	29.83	S.W.
August 25	94.0	62.0	79.0	65.9	29.82	W.
August 26	94.0	61.0	80.0	61.4	29.83	S.W.
August 27	95.0	60.0	78.5	64.1	29.87	S.W.
August 28	95.0	60.5	81.5	61.2	29.89	W.
August 29	92.0	65.0	81.5	58.4	29.85	S.W.
August 30	95.0	62.0	80.3	59.1	29.84	S.W.
August 31	97.0	63.0	83.0	57.1	29.89	S.W.

RIVERSIDE SIGNAL SERVICE WEATHER RECORD—Continued.

DATE.	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
September 1	100.0	64.0	82.5	53.2	29.90	S.W.
September 2	101.0	65.0	84.5	49.6	29.88	S.W.
September 3	102.0	67.5	86.5	43.4	29.83	W.
September 4	100.0	66.0	84.3	55.1	29.83	S.W.
September 5	93.0	62.0	80.5	61.4	29.87	N.W.
September 6	98.0	58.5	81.0	55.5	29.88	W.
September 7	102.5	60.0	85.0	38.7	29.87	S.W.
September 8	98.0	62.0	80.3	59.6	29.85	N.W.
September 9	97.0	63.0	80.0	57.3	29.83	W.
September 10	95.5	63.5	80.3	57.8	29.71	S.W.
September 11	89.0	62.0	77.5	63.9	29.69	W.
September 12	90.0	62.0	75.5	68.6	29.78	S.W.
September 13	90.0	65.0	76.5	66.9	29.81	S.W.
September 14	95.0	63.0	77.0	60.6	29.79	W.
September 15	97.5	62.0	78.8	54.3	29.83	S.W.
September 16	100.0	67.5	82.0	49.9	29.85	S.W.
September 17	91.0	68.0	79.0	54.3	29.81	W.
September 18	86.0	65.0	75.5	61.9	29.81	S.W.
September 19	88.0	54.0	73.8	64.4	29.89	S.W.
September 20	95.0	61.0	76.8	60.6	29.89	W.
September 21	96.0	63.0	76.8	51.5	29.85	S.W.
September 22	85.0	67.0	74.2	66.3	29.84	S.W.
September 23	85.0	65.0	73.5	60.4	29.89	W.
September 24	88.0	56.0	73.5	62.0	29.96	S.W.
September 25	96.0	56.0	79.0	52.7	29.93	W.
September 26	100.0	63.0	82.0	45.5	29.88	S.W.
September 27	95.0	62.0	78.0	49.9	29.88	S.W.
September 28	93.0	58.0	76.3	72.0	29.91	W.
September 29	91.0	57.0	75.5	64.8	29.95	S.W.
September 30	87.0	54.0	73.5	66.1	29.94	W.
October 1	77.0	58.0	69.0	64.9	29.87	S.W.
October 2	79.0	61.0	67.0	71.6	29.84	N.W.
October 3	79.0	61.0	67.8	71.1	29.84	N.W.
October 4	79.0	59.0	66.8	77.3	29.83	W.
October 5	70.0	57.0	65.0	81.7	29.83	W.
October 6	75.0	59.5	65.3	72.9	29.87	S.W.
October 7	80.0	59.0	67.5	71.6	29.90	S.W.
October 8	87.0	48.0	66.0	64.9	29.90	W.
October 9	93.0	50.0	72.5	49.7	29.88	W.
October 10	98.0	55.0	75.5	47.1	29.86	S.W.
October 11	97.0	56.0	72.5	47.7	29.86	W.
October 12	91.0	53.5	71.5	44.8	29.88	S.W.
October 13	87.0	50.0	67.5	56.6	29.87	W.
October 14	86.0	48.0	70.0	58.2	29.89	N.W.
October 15	86.0	49.5	69.0	60.1	29.90	S.W.
October 16	84.0	49.0	67.0	60.1	29.88	S.W.
October 17	74.0	51.0	65.0	65.9	29.80	N.E.
October 18	66.0	59.0	63.0	89.8	29.83	N.W.
October 19	80.0	57.0	69.3	67.2	29.90	W.
October 20	78.0	50.0	65.3	72.6	29.87	S.W.
October 21	76.5	54.0	68.3	45.4	29.90	N.
October 22	82.0	53.0	70.5	42.5	29.99	N.
October 23	83.0	46.0	65.5	59.4	29.98	W.
October 24	76.0	43.0	58.8	54.9	29.90	W.
October 25	74.0	49.0	61.0	59.9	29.84	N.W.
October 26	74.0	49.0	61.5	76.5	29.84	N.W.
October 27	81.0	46.0	64.0	61.9	29.88	S.W.
October 28	84.0	48.0	67.3	50.3	29.93	S.W.
October 29	74.0	49.0	64.5	75.3	29.98	N.W.
October 30	70.0	55.0	67.0	68.7	29.91	N.
October 31	68.0	55.0	64.5	70.3	29.87	W.

Rainfall for October, .10 inch.

RIVERSIDE SIGNAL SERVICE WEATHER RECORD—Continued.

DATE.	Maximum Temp.	Minimum Temp.	Mean Temp.	Average Humidity.	Mean Barometer.	Direction of Wind.
November 1	74.0	57.0	64.5	69.1	29.99	N.W.
November 2	79.0	45.0	65.0	59.2	30.04	S.
November 3	75.0	58.0	68.5	72.4	29.94	W.
November 4	69.0	57.0	63.5	73.9	29.94	S.W.
November 5	70.0	48.0	60.0	53.4	29.99	N.
November 6	73.0	38.0	58.0	53.7	29.97	N.W.
November 7	73.0	39.0	60.3	62.5	29.92	N.
November 8	73.0	45.0	60.8	53.0	29.95	S.
November 9	71.0	38.0	60.0	56.2	29.97	N.E.
November 10	72.0	40.0	61.5	64.2	29.89	N.W.
November 11	69.0	39.5	58.5	62.8	29.85	W.
November 12	69.0	41.5	57.5	75.4	29.90	S.W.
November 13	72.5	37.0	63.0	72.3	29.96	W.
November 14	70.0	37.0	57.0	69.2	29.97	N.W.
November 15	68.0	44.0	57.5	73.6	29.93	S.
November 16	62.0	50.0	58.5	85.3	29.86	S.E.
November 17	68.0	53.0	62.5	83.9	29.90	S.E.
November 18	70.0	57.0	65.5	78.1	29.98	S.W.
November 19	74.0	49.5	65.5	74.8	30.02	W.
November 20	73.5	49.0	62.0	73.5	29.88	N.W.
November 21	69.0	51.0	60.5	73.2	29.85	N.W.
November 22	66.0	45.0	57.0	83.4	29.80	S.
November 23	62.0	49.0	57.0	82.5	29.66	S.E.
November 24	66.0	49.0	58.5	70.4	29.68	N.
November 25	69.0	52.0	61.5	66.5	29.79	W.
November 26	64.0	54.5	59.0	73.1	29.87	S.W.
November 27	67.0	51.0	57.0	73.6	29.88	W.
November 28	66.0	41.0	55.0	68.5	29.00	S.W.
November 29	62.0	37.0	51.5	72.5	29.00	S.W.
November 30	63.0	36.0	50.5	73.7	29.96	S.W.
December 1	65.0	38.0	52.5	73.9	29.98	W.
December 2	69.0	37.0	56.5	60.3	30.02	N.W.
December 3	72.0	41.0	58.0	61.3	30.07	N.E.
December 4	73.0	43.0	57.5	56.8	30.10	N.E.
December 5	72.0	41.0	57.5	44.9	29.94	N.E.
December 6	67.0	41.0	54.5	65.9	29.77	W.
December 7	70.0	39.0	55.5	67.4	29.87	S.W.
December 8	70.0	37.0	56.5	67.3	30.03	S.W.
December 9	72.0	39.0	56.5	61.3	29.95	W.
December 10	59.0	38.0	45.5		29.90	W.
December 11	69.0	33.0	50.5		29.89	N.
December 12	68.0	34.0	47.2		29.89	E.
December 13	60.0	40.0	51.8		29.87	S.E.
December 14	53.0	46.0	49.0		29.88	W.
December 15	60.0	46.0	54.5		30.09	S.E.
December 16	62.0	52.0	54.5		30.14	W.
December 17	70.0	47.0	57.5		30.03	N.
December 18	71.0	51.0	59.2		30.04	N.
December 19	73.0	49.0	61.8		30.00	N.
December 20	72.0	46.0	57.2		29.95	E.
December 21	63.0	50.0	55.3		29.77	S.E.
December 22	53.0	48.0	50.2		29.61	S.E.
December 23	58.0	46.5	51.0		29 72	W.
December 24	60.0	45.0	51.8		29.89	W.
December 25	59.0	43.0	50.5		29.99	E.
December 26	54.0	45.0	51.2		29.95	S.E.
December 27	62.0	46.0	49.5		29.96	W.
December 28	56.0	38.0	46.5		30.01	W.
December 29	61.0	36.0	46.0		30.06	W.
December 30	58.0	36.0	46.2		30.07	N.
December 31	59.0	34.0	47.3		30.08	N.

Rainfall for November, 2.66 inches. Rainfall for December, 2.99 inches.

Report for the Year 1888.

Mean barometer	29.901
Highest barometer, January seventeenth	30.39
Lowest barometer, December twenty-second	29.58
Yearly range	.81
Highest temperature, September seventh	105°
Lowest temperature, January twelfth and sixteenth	25°
Mean temperature	62.1°
Yearly range	70°
Greatest daily range, June eighth	51°
Least daily range, December twenty-second	5°
Mean daily range	28°
Mean maximum temperature	77.7°
Mean minimum temperature	49.7°
Total rainfall	14.70

The mean temperature for the past eight years is 63.9°, showing the past year to be 1.8° cooler than the average. Light shocks of earthquake were observed on April eighth, at 7:40 P. M.; April ninth, at 7:05 A. M.; April twelfth, at 5:15 A. M.; and June fifteenth, at 7:40 P. M.

Summary for the Year 1887.

Month.	Mean Temperature.	Highest Temperature.	Lowest Temperature.	Rainfall, in Inches.	Prevailing Wind Direction.
January	51.4	78.0	25.5	.13	N.
February	49.7	84.0	29.0	2.85	S.W.
March	69.0	88.0	39 0	.02	S.W.
April	64.1	89.5	43.0	1.71	S.W.
May	67.4	90.5	44.0	.17	S.W.
June	71.3	99.0	47.0	.00	S.W.
July	76.2	105.0	50.0	.00	S.W.
August	73.6	99.5	51.0	.00	S.W.
September	73.3	98.0	48.0	.00	S.W.
October	66.5	94.0	42.0	.86	S.W.
November	57.9	85.0	33.0	.92	S.W.
December	50.1	72.0	29.5	1.50	S.W.
Yearly average	63.5	105.0	25.5	8.16	S.W.

Chino, San Bernardino County.

Chino, San Bernardino County, Cal., February 18, 1889.

Sergeant James A. Barwick, *Observer Signal Corps, Sacramento, California:*

Dear Sir: Replying to your request for a brief and instructive article on the temperature and rainfall of San Bernardino County, with data as far back as possible, I have to say, the data at my command are insufficient to do the subjects justice. I requested several gentlemen to do the work, whose means to make a valuable report are ample, but so far they have declined by their silence. My residence at this place began in October, 1887, when I commenced to keep an accurate record of the temperature of this locality, and have daily continued it. On pages 182–3 of your Meteorological Review for 1887, are tables showing the rainfall and temperature at Riverside, San Bernardino, Colton, and other points. As San Bernardino County comprises every elevation, from about sea level on the Colorado Desert to over ten thousand feet on several mountain tops, the reader will understand that to compile comprehensive and accurate meteorological statistics of this county involves the collection of a vast amount of statistics, some of which have never been collected by anybody.

A chief cause of irritation between the southern, central, and northern parts of this great State, is the lack of information about most sections by a great majority of our writers of books, and for the press, both in and out of California. The mass of writers are disposed to be fair, but their very limited knowledge of a State over eight hundred miles in length, embracing nearly every degree of temperature, between 15° below zero and 130° or even more above, with a rainfall varying each year from about two inches at Yuma to over sixty at Shasta, disqualifies nearly all from handling such subjects with tolerable intelligence. Notwithstanding I have been traveling over this State by all modes of conveyance and afoot since 1852, I do not want to be quoted as authority on much of even San Bernardino County. I deem these remarks apt in connection with what follows. This place is situated near the western boundary of San Bernardino County, about eight hundred feet above sea level. The Chino and Spadra hills lie to the south and west a few miles, and the San Gabriel and San Bernardino Mountains (erroneously called Sierra Madres), to the north, some eight miles, and the San Jacinto and other high mountains between here and the great Colorado desert. The rainfall was not accurately noted here during the season of 1887–8, but it amounted to just about 17 inches. The temperature here given is correct: The lowest degree was January sixteenth, when it was 23° at 7 A. M.; on the fifteenth and sixteenth, it was 26°. The highest at noon was July twenty-first, when it was 104°. The days when the mercury rose to and above 100° are: July fifteenth, 101°, and twenty-first, 104°; August eleventh, twelfth, and thirteenth, 100° each; September third, 100°; seventh, 103°; sixteenth and twenty-sixth, each 101°.

For November, 1887, the lowest temperature was 30° at 7 A. M., on the thirtieth, and the highest, 78° on the twenty-first, at noon; the average for the month being 58.8°. For December, the lowest was 28° at 7 A. M. on the twenty-third, and the highest 72° at noon on the seventeenth; the average for the month being 50.1°. The average for the first twelve days in January, 1888, was 43.5°. The observations in all cases being taken at 7 A. M., noon, and 6 P. M. Following are weekly averages from such observations during the remainder of 1888:

January 19	44.2	July 12	76.1
January 26	56.0	July 19	81.7
February 2	52.7	July 26	82.7
February 9	51.2	August 2	75.0
February 16	52.3	August 9	80.0
February 23	55.4	August 16	78.7
March 1	52.7	August 23	76.1
March 8	50.4	August 30	76.4
March 15	56.0	September 5	83.0
March 22	57.9	September 12	77.4
March 29	54.8	September 19	78.6
April 5	58.1	September 26	76.9
April 12	65.4	October 4	68.9
April 19	66.2	October 11	71.8
April 26	63.1	October 18	68.4
May 3	65.1	October 25	64.4
May 10	64.9	November 1	63.6
May 17	67.3	November 8	60.8
May 24	65.3	November 15	56.9
May 31	67.4	November 22	58.5
June 7	69.2	November 29	56.3
June 14	75.7	December 6	56.4
June 21	74.0	December 13	52.2
June 28	73.9	December 20	57.9
July 5	77.6	December 27	52.6

Average for the four days ending December thirty-first, 48.2°.

San Bernardino County produces everything grown in the temperate and some things that flourish in the torrid zone. The Secretary of the San Bernardino Board of Trade gathered from reliable sources the following information in January, this year, viz.:

A FEW FACTS RELATIVE TO HER PRODUCTS AND IMPROVEMENTS.

Population of the county, 35,000. The assessed valuation of all property in the county, $26,250,680. Rate of taxation, State and county, $1 25 outside, and $1 inside the limits of incorporated towns. The county is free from debt. The county ranks first in the State in the amount of school property per child, and fifth in total valuation of school property.

There are 528 miles of standard gauge, 32½ miles of motor and narrow gauge, and 21 miles of electric railroads (last temporarily operated by horse-power) in the county.

Shipments of oranges, season of 1887–8, 760 carloads; product present season estimated at 1,050 carloads. Raisin shipments the past year, about 325 carloads; dried fruit shipments the past year, over 1,150 tons; wine, product the past year, about 250,000 gallons; honey, product the past year, about 435 tons; canned fruits, product the past year, 30,000 cases; barley, product the past year, 240,000 sacks; lumber, product the past year, 7,400,000 feet; wool clipped the past year, 350,000 pounds; gold and silver, product the past year, $850,000. There are about 5,000 acres in the county seeded to alfalfa, part of which is used for grazing and part for hay. The shipments in lemons, limes, English walnuts, and almonds are small. Aside from what is dried, canned, or otherwise put up, the crops of peaches, apricots, nectarines, prunes, apples, pears, figs, and olives are used locally. Wheat, oats, and Indian corn are grown in small quantities, and every kind of garden vegetable in great profusion. Lime is a prominent product of the county. Colton marble and building stone are gaining a name away from home. South Riverside boasts of the best tin mine on the continent, also coal, mineral paint, and gypsum deposits; and in the northern part of the county there are heavy deposits of borax, iron, and salt.

Evidently, for want of full information, the Secretary omitted important products. The foothill and mountain valleys of this county produce cherries and apples that are not excelled in the world for flavor and keeping qualities, and they are grown in paying quantities. As high as $250 to $300 per acre were realized from cherries and apples in 1888 from trees ranging in age from six to thirteen years. The leading products of this county are now oranges and raisins. Each year increases the growth of oranges, and the quality is unsurpassed. Neither the scale of any kind nor the vine disease has so far injured an orchard or vineyard. Doubtless its inland situation is unfavorable to scale.

Trusting the foregoing will be deemed worthy a place in your next report to the State Agricultural Society, I am,

Yours respectfully,

JOHN WASSON.

Rainfall at San Bernardino, San Bernardino County.—The rainfall at San Bernardino was furnished by Mr. Sidney P. Waite, of the San Bernardino Water Company, and extends from July, 1870, to date.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1870							none	none	.02	.09	3.11	.89			
1871	6.91	2.21	.19	.34	.11	.07	none	.04	.13	.60	.88	3.91	15.39	1870–71	13.94
1872	none	2.20	.37	.79	.06	none	none	.18	.04	none	1.17	4.40	9.21	1871–72	8.98
1873	6.50	1.25	.51	.84	.21	none	none	1.06	.02	.01	.74	5.73	16.87	1872–73	15.10
1874	5.51	8.76	1.08	.48	.42	none	none	none	.06	1.82	1.88	2.20	23.21	1873–74	23.81
1875	7.20	.15	.22	.07	.05	none	none	none	none	none	7.50	.02	15.21	1874–75	13.65
1876	6.55	1.92	3.41	.44	.03	.03	none	none	none	.20	.40	none	12.98	1875–76	19.90
1877	3.50	4.03	.83	.26	.30	none	none	none	none	.86	.50	3.95	14.23	1876–77	9.52
1878	3.33	6.68	2.57	1.71	.66	.07	.07	none	.02	.14	.05	4.70	20.00	1877–78	20.33
1879	3.59	1.00	.50	1.20	.24	.03	.11	.02	.01	.94	3.40	6.50	17.54	1878–79	11.54
1880	1.56	1.33	1.45	5.00	.04	none	none	none	none	.14	.67	8.80	18.99	1879–80	20.36
1881	1.40	.36	1.66	.46	.01	none	none	none	none	.80	.27	.50	5.46	1880–81	13.50
1882	1.11	2.65	3.30	2.91	none	none	none	none	none	.10	.15	.45	9.67	1881–82	11.54
1883	1.60	1.10	2.82	2.95	none	none	.19	none	.53	.85	.09	2.63	12.76	1882–83	9.17
1884	1.63	12.20	9.95	5.68	3.17	.59	none	none	none	none	.11	3.75	37.08	1883–84	37.51
1885	2.79	.11	.28	1.89	1.69	.19	none	none	none	.39	4.36	1.20	12.90	1884–85	10.81
1886	6.44	2.52	4.18	2.36	.32	.16	none	none	none	none	.11	.61	16.70	1885–86	21.93
1887	.39	6.44	4.41	1.90	.42	.22	.11	.04	.09	1.17	2.29	1.91	19.39	1886–87	14.50
1888	4.01	3.60	3.41	.58	.52	.03	none	none	none	.05	4.12	4.64	20.96	1887–88	17.76
1889	.93	1.50	6.55											1888–89	*17.79

*Up to April 1, 1889.

Weather Summary for San Bernardino.

The following summary of the weather for January, February and March, 1889, was furnished by Mr. A. K. Holt, editor of the "Times-Index," and also Voluntary Observer Signal Service, U. S. Army:

Summary for January.

Highest barometer	30.10
Lowest barometer	29.35
Mean barometer	29.84
Highest temperature	76.50
Lowest temperature	33.00
Mean temperature	52.30
Mean humidity	69.00
Total rainfall	.93
Number of days on which rain fell	4
Number of days totally clear	21
Number of days totally cloudy	2

Summary for February.

Highest barometer	30.10
Lowest barometer	29.41
Mean barometer	29.86
Highest temperature	81.50
Lowest temperature	33.50
Mean temperature	57.60
Mean humidity	65.80
Total rainfall	1.50
Number of days on which rain fell	4
Number of days totally clear	21
Number of days totally cloudy	0

Summary for March.

Highest barometer	30.18
Lowest barometer	29.43
Mean barometer	29.85
Highest temperature	82.50
Lowest temperature	45.50
Mean temperature	59.64
Mean relative humidity	76.57
Total rainfall	6.55
Number of days on which rain fell	6
Number of days totally clear	15
Number of days totally cloudy	0

The rainfall for season of 1888–89 to April 1 is as follows:

October	.05
November	4.12
December	4.64
January	.93
February	1.50
March	6.55
Total	17.79

Table Showing Average Temperature and Rainfall.

Stations.	Elevation—Feet	Average Winter Temperature	Average Spring Temperature	Average Summer Temperature	Average Autumn Temperature	Average Annual Temperature	Highest Temperature	Lowest Temperature	Average Seasonal Rainfall—Inches.
Riverside	------	50.4	64.1	73.7	65.7	63.5	105	25	8.16
Colton	965	52.0	62.7	78.3	65.3	64.6	116	20	9.84
Daggett	2,010	47.9	57.8	84.3	71.0	65.2	104	20	3.98
Fenner	2,095	51.2	70.7	88.0	70.6	70.1	112	22	7.47
Needles	485	51.7	69.1	87.7	72.0	70.1	114	26	6.27
King's Station	4,300	41.0	49.8	65.3	54.8	52.7	99	12	22.49

Yearly Summary of the Weather at San Diego.

Furnished by Sergeant Hearn, Observer Signal Corps.

Annual mean barometer corrected for temperature only, 29.915 inches; highest, 30.33; lowest, 29.62 inches.

Annual mean temperature, 61.2°; mean maximum, 67.9°; mean minimum, 55.7°; annual mean dew point, 55.5; annual mean relative humidity, 82.6 per cent; annual mean cloudiness, 5.2; total precipitation, 11.57 inches. Total annual velocity of wind, 46.339 miles; prevailing direction of wind during the year, northwest. Total clear days, 152; fair, 97; cloudy, 117; rainy, on which the precipitation was appreciable, 51; maximum temperature above 90° during the year, 1; thunder and lightning storms, 3.

Rainfall at San Diego, San Diego County.—This table runs from November 1, 1871, to date. The figures are from the annual reports of the Chief Signal Officer. They show the rainfall by calendar years and seasonal years; also, the totals and averages by months:

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total for Year.	Season of.	Total for Season.
1871											1.19	1.39			
1872	.99	1.63	.46	.26	.12	none	none	.18	none	none	none	1.41	5.05	1871–72	6.04
1873	.34	4.15	.11	.10	.01	none	none	1.95	none	none	.77	5.46	12.89	1872–73	6.30
1874	3.11	3.73	1.20	.35	.32	none	.12	none	.04	.53	.88	.55	10.83	1873–74	16.89
1875	2.38	.37	.45	.12	.20	.02	none	.21	.39	none	2.25	.41	6.80	1874–75	5.66
1876	2.47	2.44	1.78	.06	.05	.05	.03	.06	.03	.08	.04	.15	7.24	1875–76	10.11
1877	1.05	.23	1.44	.26	.43	none	none	none	none	.81	.06	3.89	8.17	1876–77	3.80
1878	1.45	4.83	1.41	2.91	.58	.16	none	none	none	.96	none	1.57	13.87	1877–78	16.10
1879	3.54	1.04	.10	.60	sprin.	.07	none	none	none	.29	2.77	6.30	14.71	1878–79	7.88
1880	.61	1.50	1.43	1.34	.06	.06	.09	.32	none	.53	.28	4.15	10.37	1879–80	14.36
1881	.52	.45	1.88	1.35	.04	.05	none	.01	.04	.24	.12	.30	5.00	1880–81	9.66
1882	4.53	2.55	1.02	.45	.18	.07	none	none	.01	.41	.39	.13	9.74	1881–82	9.51
1883	1.09	.95	.41	.31	1.14	.08	none	none	none	2.01	.20	1.82	8.01	1882–83	4.92
1884	1.34	9.05	6.23	2.84	2.17	.31	none	none	.07	none	.11	4.83	26.95	1883–84	25.97
1885	.35	.02	.78	1.20	.61	.06	sprin.	.13	sprin.	.31	1.56	.70	5.72	1884–85	8.03
1886	7.00	1.50	3.73	1.95	.04	.07	sprin.	sprin.	none	.05	.95	.10	15.39	1885–86	16.99
1887	.04	4.51	.02	2.14	.47	.04	.01	sprin.	sprin.	sprin.	2.08	1.14	10.72	1886–87	8.32
1888	1.96	1.48	2.79	.10	.22	.04	.01	sprin.	.04	.26	1.83	2.84	11.57	1887–88	9.82
1889	1.72	1.80												1888–89	*8.50

*Up to March 1, 1889.

SUMMARY FOR APRIL, 1889.

SIGNAL SERVICE, U. S. ARMY,
DIVISION OF THE PACIFIC,
SAN FRANCISCO, CAL., May 1, 1889.

The month has been marked by the absence of storms accompanied by dangerous winds. Copious showers have fallen during the month in Oregon, Washington, and Northern California, and light showers in Southern California.

The temperature has been much higher than usual in all districts.

The following table shows the distribution of the rainfall for the month and season up to May 1, 1889:

STATIONS.	Normal for April.	Total for April, 1889.	Average for Season to May 1st.	Total for Season to May 1, 1889.
Olympia, Washington	3.80	1.88	52.98	29.83
Walla Walla, Washington	1.61	1.51	14.18	9.25
Portland, Oregon	3.43	2.66	46.85	24.88
Roseburg, Oregon	3.10	1.56	32.25	18.00
Winnemucca, Nevada	1.16	.06	7.41	2.56
Red Bluff, California	2.82	1.01	23.10	20.18
Chico, California	1.63	.97	17.99	18.01
Willows, California	1.90	.27	10.98	12.40
Orland, California	1.79	1.02	13.12	12.90
Davisville, California	1.74	1.17	15.02	18.41
Colfax, California	5.34	3.25	41.81	30.25
Sacramento, California	3.28	.24	20.54	16.21
Napa, California	2.99	1.67	22.22	20.39
Santa Rosa, California	----------	1.09	----------	20.60
San Francisco, California	2.38	.97	23.09	21.66
Livermore, California	1.44	.51	13.10	13.44
Lathrop, California	1.82	.33	10.07	10.40
Folsom, California	2.59	.48	21.76	19.32
Niles, California	1.68	.92	16.28	14.19
Salinas, California	1.52	.82	12.87	10.69
South Vallejo, California	1.89	.73	13.05	14.99
San José, California	1.62	.79	12.32	14.71
San Mateo, California	2.19	.84	17.97	18.93
Santa Cruz, California	3.47	.84	23.91	21.57
Menlo Park, California	2.23	.69	13.62	14.92
Livingston, California	----------	.10	----------	9.34
Anaheim, California	1.22	1.04	10.29	15.80
Merced, California	1.53	.20	10.11	7.03
Modesto, California	1.14	.19	8.76	7.72
Fresno, California	2.15	.52	9.58	7.05
Delano, California	1.17	.12	4.92	5.62
Antioch, California	1.45	.46	10.49	11.92
Athlone, California	----------	.77	----------	3.30
Bakersfield, California	.95	.15	4.67	4.66
Gilroy, California	2.05	.63	18.64	12.41
Selma, California	----------	.47	----------	6.65
Tulare, California	1.11	.66	6.39	7.16
Turlock, California	1.76	.17	8.88	7.77
Los Angeles, California	2.17	.24	17.01	18.98
Newhall, California	1.82	.43	14.26	20.93
San Diego, California	1.01	.15	9.31	10.78
Keeler, California	.51	.12	2.92	5.18
Yuma, Arizona	.11	.00	2.65	4.15

RAINFALL, TEMPERATURE, AND CLEAR DAYS FOR THE SOUTHERN STATES AND PACIFIC COAST.

The tabulated matter in the following tables was taken from the Chief Signal Officer's annual report for the year 1886, and gives the average yearly rainfall, average winter, spring, summer, and autumn temperatures, also the average annual temperature, the highest and lowest temperature, and the average annual number of clear days for the Southern States, Arizona, California, Oregon, and Washington Territory. The States represented in this table are Virginia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Arkansas, Tennessee, Kentucky, Missouri, and Texas, Arizona, and Washington Territories, and California and Oregon. California stands ahead of all the Southern States in its having more clear days and a higher minimum temperature than any point in the south except Key West, Florida. This table will be found valuable because it represents such a great number of points in all the Southern States except Maryland and Delaware:

AVERAGE TEMPERATURE, CLEAR DAYS, AND RAINFALL, FOR THE SOUTHERN STATES.

STATES AND STATIONS.	Average Rainfall	Average Winter Temperature	Average Spring Temperature	Average Summer Temperature	Average Fall Temperature	Average Annual Temperature	Highest Temperature	Lowest Temperature	Average Annual No. Clear Days.
Virginia:									
Norfolk	51.61	42.2	57.0	77.3	60.7	59.3	102.5	6.0	121.3
Lynchburg	42.21	38.8	56.1	76.3	57.7	57.6	101.8	*5.0	131.6
North Carolina:									
Charlotte	54.47	43.8	59.6	77.1	61.5	60.6	101.0	*5.0	108.5
Hatteras	73.61	46.4	57.1	76.6	66.4	61.8	92.0	8.0	97.8
Kitty Hawk	65.55	43.8	55.4	76.1	63.3	59.8	100.0	8.0	125.5
Fort Macon	59.16	47.3	58.8	77.2	66.0	62.4	91.0	8.5	100.4
Smithville	50.84	48.4	61.6	79.0	65.2	63.5	100.0	6.0	121.5
Wilmington	57.79	48.2	62.0	78.5	64.0	63.1	103.0	9.0	124.4
Asheville	40.20	37.9	53.5	70.7	53.5	53.9	90.0	*1.0	------
South Carolina:									
Charleston	59.92	51.2	65.0	81.0	66.8	66.2	104.0	13.0	132.5
Aiken	------	45.8	61.3	77.4	62.0	61.6	102.0	3.0	------
Georgia:									
Augusta	49.43	48.8	64.2	80.2	64.5	64.7	105.0	7.0	126.8
Savannah	52.70	52.9	66.6	81.1	66.9	67.1	105.0	15.0	118.2
Atlanta	56.08	46.1	61.3	76.5	62.4	61.7	97.5	*1.3	114.8
Florida:									
Jacksonville	54.70	56.8	69.1	81.4	69.9	69.5	104.0	19.0	124.0
Cedar Keyes	55.86	60.1	70.3	81.7	72.4	71.1	96.0	22.0	162.0
Key West	40.31	70.8	76.9	83.8	78.8	77.7	97.0	44.0	114.8
Sanford	45.72	61.6	71.6	80.5	73.3	71.8	99.4	28.5	131.0
Pensacola	67.31	56.0	67.9	80.3	69.5	68.4	97.2	16.3	128.2
Alabama:									
Mobile	65.47	52.6	67.2	81.2	67.7	67.2	101.0	13.9	127.8
Montgomery	53.15	50.4	65.3	80.6	65.5	65.6	106.9	8.0	118.0
Mississippi:									
Vicksburg	61.06	50.4	66.0	80.8	65.5	65.7	101.0	10.0	124.0
Louisiana:									
New Orleans	64.29	56.0	69.0	81.9	69.9	69.4	97.0	20.0	111.9
Shreveport	53.62	48.9	66.1	81.9	65.2	65.7	107.0	6.0	126.1
Arkansas:									
Fort Smith	45.80	37.7	59.4	77.7	62.8	59.5	104.5	*5.0	128.4
Little Rock	59.27	45.3	62.3	78.8	63.1	62.3	102.0	5.5	146.6
Tennessee:									
Chattanooga	59.85	44.2	60.1	76.2	61.3	60.4	101.0	*1.0	117.3
Knoxville	53.88	39.7	57.2	74.8	57.7	57.5	100.0	*16.0	117.4
Memphis	55.97	42.7	61.3	79.5	60.9	61.2	102.0	*2.0	124.3
Nashville	52.10	41.2	59.7	78.5	59.7	59.8	104.0	*10.0	100.9
Kentucky:									
Louisville	48.53	37.2	55.7	76.7	57.6	57.0	104.6	*19.0	104.3
Missovri:									
St. Louis	37.73	34.1	54.7	76.7	56.3	55.4	106.4	*21.0	119.1
Texas:									
Galveston	53.01	55.5	69.9	83.5	71.4	70.2	98.5	18.0	124.6
Indianola	37.62	55.6	70.4	82.8	71.5	70.1	100.0	14.0	124.2
Palestine	50.11	48.6	65.5	79.9	67.1	65.0	98.2	6.5	129.8
Brownsville	32.93	60.4	74.3	83.5	73.6	72.8	102.0	18.0	119.5
Rio Grande City	21.98	60.3	76.0	85.2	73.3	73.4	112.0	19.0	156.1
Fort Elliott	23.81	33.7	54.8	74.4	55.4	54.6	102.0	*12.0	183.8
Fort Concho	30.11	45.6	65.1	80.7	63.2	63.6	110.0	*1.0	162.7
Fort Davis	20.33	45.5	61.3	74.0	59.3	59.8	111.0	Zero.	199.2
Fort Stockton	19.21	46.0	64.3	79.2	62.0	62.8	107.4	2.0	203.0
El Paso	12.50	47.2	64.0	80.6	62.2	63.2	113.0	*5.0	223.6

*Below zero.

ARIZONA, CALIFORNIA, OREGON, AND WASHINGTON TERRITORY—MEAN AVERAGE TEMPERATURE, CLEAR DAYS, AND RAINFALL.

STATES AND STATIONS.	Average Rainfall	Average Winter Temperature	Average Spring Temperature	Average Summer Temperature	Average Fall Temperature	Average Annual Temperature	Highest Temperature	Lowest Temperature	Average Annual No. Clear Days
Arizona Territory:									
Fort Apache	23.70	36.1	50.5	69.6	52.4	52.0	102.5	*9.0	207.5
Fort Grant	16.91	44.4	58.7	76.2	60.9	60.0	103.0	10 0	203.5
Prescott	15.40	35.4	49.4	69.7	52.2	52.1	103.0	*18.0	234.8
Camp Thomas	11.73	43.4	60.4	80.7	60.1	61.4	112.5	10.0	204.3
Yuma	2.53	56.1	70.2	89.6	73.9	72.0	118.0	22.0	279.9
California:									
San Diego	10.81	54.6	58.1	66.8	62.6	60.5	101.0	32.0	122.3
Los Angeles	17.95	53.6	58.4	67.8	62.7	60.5	108.0	28.0	171.3
San Francisco	24.11	51.3	54.6	58.5	58.2	55.7	95.2	33.0	146.7
Sacramento	19.94	48.3	59.5	71.7	61.5	60.2	106.0	19.0	240.0
Red Bluff	27.45	46.8	59.8	79.7	63.2	62.4	110.5	19.0	227.7
Cape Mendocino	18.50	46.7	49.1	54.5	53.9	51.2	90.0	28.5	165.0
Oregon:									
Roseburg	35.48	41.0	51.2	64.1	51.7	51.9	97.2	3.3	103.4
Portland	52.99	40.6	51.6	64.4	52.8	52.4	99.0	3.0	87.3
Washington Territory:									
Olympia	59.14	38.8	48.5	60.7	49.4	49.2	95.0	2.0	64.1
Fort Canby	45.98	40.4	49.3	58.2	52.8	50.2	90.3	16.0	101.6

*Below zero.

THE FOUR CITRUS BELTS OF THE NORTHERN HEMISPHERE.

The following tables show the temperature at places situated in the four recognized citrus belts of the northern hemisphere, and certainly the Central California citrus belt has no cause to complain of being colder, or its climate less equable than the other so called citrus regions. Take Northern Italy, the portion along the northern shores of the Mediterranean Sea has about the same climate, but the towns are running in opposition to each other as health and winter resorts, for which reason their reported minimum temperatures should be looked upon with some discredit. No doubt the low temperature recorded at Cannes is a fair sample of what it is. From that place to Genoa on the east, 20° is recorded as the lowest. In all probability 2° less than that would be nearer the mark. The winter temperature of any place in Central California in the following table will beat the Italian citrus climate.

Now take Florida. We find that Jacksonville and Pensacola have high annual and winter temperatures; but look at their minimum of 19° and 16°, respectively. If citrus fruits can stand that temperature in Florida without serious damage, what is to hinder the same kind of fruit in the central citrus belt of California from pushing ahead? Here they have never recorded as low a temperature as Pensacola. Take the citrus belt of Southern California. Look at the minimum temperature at Poway, San Diego County—21° in 1878 and 1881. In all probability it went as low as 18° during the passage of the cold wave of January, 1888. Poway, Los Angeles, and Riverside have exactly the same winter temperature as Marysville and Nicolaus, and 2° lower than Oroville. Riverside is reported to have had a minimum temperature of 17°. (See "Bee" of January 18, 1888, letter from W. G. Williams, of Loomis, Placer County.) Los Angeles must have had a temperature of at least 20° during our past cold spell, although her record before this was 23° as the lowest.

From these tables a great deal of information on the temperature of the four citrus belts can be learned. The yearly and winter temperature in Florida goes to show that one cannot judge understandingly of a climate for citrus fruits unless he knows the actual minimum or lowest temperature that occasionally sweeps over such semi-tropic belts. The tables are as follows:

ITALIAN CITRUS BELT.

PLACES.	Average Yearly Temperature.	Average Winter Temperature.	Average Temperature Coldest Month.	Lowest Temperature.
Naples	61.3	48.5	47.0	----
Rome	60.7	48.9	45.0	----
Florence	58.8	44.3	44.0	----
Pisa	60.4	46.4	45.8	----
Genoa	60.4	44.9	44.0	----
San Remo	60.1	48.9	48.0	23.0
Mentone	60.9	49.0	48.7	23.0
Nice	59.5	47.8	40.9	----
Cannes	59.9	49.6	48.8	20.0

SEMI-TROPIC FLORIDA.

PLACES.	Average Yearly Temperature.	Average Winter Temperature.	Average Temperature Coldest Month.	Lowest Temperature.
Jacksonville	69.5	58.7	57.4	19.0
Pensacola	68.4	55.7	54.1	16.0
Sandford	71.0	58.0	55.0	28.0

SOUTHERN CALIFORNIA CITRUS BELT.

PLACES.	Average Yearly Temperature.	Average Winter Temperature.	Average Temperature Coldest Month.	Lowest Temperature.
Poway	59.3	50.2	48.4	21.0
Riverside	61.0	50.4	49.7	*17.0
Los Angeles	60.5	50.0	52.0	23.0
Santa Barbara	61.1	54.0	52.9	30.0

*See letter of W. G. Williams, in "Sacramento Bee," January 18, 1888.

THE GREAT CITRUS BELT OF THE SACRAMENTO VALLEY.

PLACES.	Average Yearly Temperature.	Average Winter Temperature.	Average Temperature Coldest Month.	Lowest Temperature.
Sacramento	60.2	48.3	47.0	18.0
Auburn	59.7	46.2	44.0	18.0
Colfax	59.5	46.0	43.1	18.0
Nicolaus	62.0	50.9	47.0	18.0
Marysville	64.2	50.0	48.7	18.0
Princeton	62.8	48.2	47.0	18.0
Oroville	64.9	52.0	49.4	20.0
Chico	63.8	47.0	44.6	18.0
Red Bluff	62.4	46.8	45.2	18.0
Redding	63.8	47.8	45.4	18.0

The above table shows the average yearly temperature, average winter temperature, average temperature of the coldest month, and the lowest recorded temperature known. The lowest in the great citrus belt of the Sacramento Valley is taken generally from the extraordinary cold spell of January sixth to eighteenth, being the second cold spell in forty years for our valley and State.

Monthly Temperature at the Southern Pacific Stations in California.—The mean temperature as determined from observations taken at 7 A. M., 2 and 9 P. M., by the Southern Pacific Company, during the year 1888, and compiled from their records by NELSON GOROM, Observer Signal Corps, in charge of the local Signal Office at San Francisco. (Mean—$\frac{1}{3}$ of 7 A. M. 2 and 9 P. M.)

STATIONS.	January	February	March	April	May	June	July	August	September	October	November	December	Annual Means	Highest Observed	Lowest Observed
Alcade	------	------	------	------	------	------	85.0	86.4	83.3	68.2	56.1	49.1	71.4	112	35
Almaden	46.6	54.2	54.5	61.2	62.3	68.6	70.6	72.5	69.4	64.2	56.6	54.7	61.3	102	27
Anaheim	55.6	58.5	59.5	66.9	69.9	73.5	71.3	72.1	74.8	69.3	63.4	60.9	66.3	94	34
Antioch	44.6	52.6	54.0	60.0	65.9	67.9	76.2	78.2	80.1	67.9	51.9	47.6	62.2	105	24
Aptos	46.0	51.9	53.0	58.4	59.7	67.9	65.9	63.2	61.8	59.1	53.9	54.1	57.9	88	19
Athlone	43.4	52.2	54.8	67.6	71.9	76.4	81.7	84.5	79.1	66.1	55.0	50.2	65.2	109	20
Auburn	40.4	50.9	51.3	61.4	61.0	66.9	76.5	79.5	76.9	64.2	52.9	47.1	60.8	105	12
Bakersfield	------	------	------	------	------	------	------	------	------	------	57.8	51.7	------	—	—
Beaumont	41.5	51.3	48.2	62.0	62.7	69.9	77.4	79.7	78.5	65.8	55.9	53.7	62.2	104	24
Bishop Creek	33.4	50.9	56.3	69.6	78.1	86.0	87.7	91.7	81.7	65.3	48.9	38.8	65.7	105	3
Boca	15.8	27.6	33.4	42.5	53.4	58.4	67.9	63.6	60.4	43.5	33.5	31.2	44.3	95	—39
Borden	43.8	51.7	54.7	69.5	70.5	75.4	82.5	86.8	—	—	—	48.9	64.9	115	17
Boulder Creek	------	------	------	------	------	------	—	------	66.8	58.6	51.8	51.7	57.2	—	—
Brentwood	42.2	51.3	57.8	67.6	75.6	77.8	84.7	83.1	77.1	71.1	49.8	49.9	65.7	102	19
Brighton	45.4	54.5	55.3	66.9	69.1	74.6	79.8	81.8	81.7	71.3	59.1	49.6	65.8	109	22
Byron	41.8	56.5	59.4	69.2	69.5	78.2	80.3	84.5	79.0	69.1	57.9	53.2	66.6	108	22
Cactus	------	------	------	------	------	------	------	------	------	------	------	—	------	------	------
Castroville	------	------	------	------	------	------	------	------	------	------	------	—	------	------	------
Caliente	47.0	55.4	53.3	67.9	74.1	75.1	83.5	82.1	82.9	69.6	56.5	52.9	66.7	107	20
Calistoga	44.4	53.7	55.1	60.3	58.5	64.8	67.3	68.7	65.8	61.7	54.7	52.7	59.0	108	22
Chico	42.6	54.9	56.4	70.9	71.6	75.1	86.0	86.2	83.0	67.2	54.7	51.4	67.1	111	18
Cisco	27.8	33.0	34.8	44.8	48.2	51.1	63.4	62.3	62.6	50.2	39.7	35.7	46.1	82	0
Coles	40.8	40.6	39.9	51.6	53.0	58.0	69.2	70.9	64.6	53.6	42.4	40.0	52.0	100	18
Colfax	37.8	47.8	49.0	60.4	61.2	65.4	75.0	76.8	73.7	60.9	50.7	47.6	58.9	102	16
Colton	47.7	55.6	62.0	65.0	69.2	73.2	80.4	78.0	79.3	70.4	65.7	57.2	67.0	110	26
Corning	39.9	49.0	50.1	69.5	71.4	72.6	85.6	87.1	81.6	75.1	57.5	49.3	65.7	110	25
Davisville	43.4	50.7	53.1	65.1	66.8	69.9	77.1	76.9	71.4	65.3	57.0	53.5	62.5	111	19
Delano	44.2	49.0	50.2	66.6	70.9	76.3	85.6	87.3	84.8	73.2	59.0	51.9	66.6	105	24
Delta	33.7	45.8	44.4	62.3	66.4	67.4	77.2	76.4	74.6	61.2	54.2	48 7	59.4	105	10
Downey	------	------	------	------	------	------	------	------	------	------	------	—	------	------	------
Dunnigan	45.5	57.2	61.8	71.5	73.1	79.0	82.7	83.3	80.5	71.5	55.5	52.6	67.8	114	20
Dunsmuir	------	------	43.8	53.9	51.0	52.8	59.2	58.7	61.1	62.6	53.5	44.7	54.1	98	—
Edgewood	------	------	------	------	------	------	------	68.5	63.2	55.2	48.5	40.5	55.2	—	—
El Dorado	------	------	------	------	------	------	------	------	------	------	------	48.7	—	—	—

MONTHLY TEMPERATURE AT THE SOUTHERN PACIFIC STATIONS IN CALIFORNIA—Continued.

STATIONS.	January	February	March	April	May	June	July	August	September	October	November	December	Annual Means	Highest Observed	Lowest Observed
Elmira	44.6	54.4	56.6	64.4	65.4	73.1	78.1	82.5	80.6	65.8	59.0	53.0	64.8	113	24
El Verano								70.7	67.7	62.1	55.6	53.0	61.8	—	—
Emigrant Gap	32.3	40.1	38.7	53.9	53.0	54.7	64.7	67.3	66.7	54.9	43.6	40.4	50.9	86	8
Esperanza									84.1	67.8	56.2	48.3	64.1	—	—
Eureka	44.6	48.1	47.7	50.9	53.0	58.8	56.5	—	56.5	53.0	50.2	53.0	52.0	—	20
Farmington	44.5	53.1	54.5	66.3	66.5	72.8	76.3	81.6	78.4	65.4	54.2	48.8	63.5	111	20
Felton								67.4	66.0	61.0	54.6	53.6	60.5	—	—
Florence												58.4		—	—
Folsom								82.7	80.1	68.4	56.6	51.9	67.9	—	—
Fresno	44.1	53.2	54.1	67.1	68.6	74.0	80.6	83.0	80.3	66.2	53.7	47.8	64.4	111	20
Fruto								82.2	83.3	70.9	57.4	49.7	68.7	—	—
Galt	46.8	47.5	53.1	68.2	68.7	72.7	80.1	78.6	73.8	65.8	56.0	49.6	63.4	108	20
Girard												—		—	—
Gilroy	44.8	51.1	52.3	62.0	61.8	71.9	71.4	74.1	70.8	61.7	55.4	51.4	60.7	104	20
Glen Ellen								72.2	65.9	62.2	54.9	49.2	60.9	—	—
Goshen	44.6	54.1	56.9	70.9	74.6	80.7	88.8	90.3	85.8	70.7	58.8	49.0	68.8	110	16
Hollister	47.6	54.3	54.9	60.9	61.3	67.9	68.4	68.4	63.7	59.0	53.9	53.5	59.5	104	21
Hornbrook	22.0	41.3	47.0	58.5	63.9	66.0	70.9	77.4	73.1	57.6	43.2	41.6	55.2	104	−12
Indio	47.8	60.3	62.3	75.6	74.2	89.7	96.9	95.4	93.6	79.8	65.0	55.7	74.7	112	22
Ione	42.6	50.6	50 5	61.3	65.4	75.1	80.6	82.3	78.5	67.1	59.9	58.2	64.3	110	17
King's City	44.2	48.2	47.1	55.3	63.9	68.7	70.1	68.1	68.1	61.8	55.1	52.3	58.6	110	15
Keeler	35.1	47.3	50.1	63.9	66.0	74.0	81.7	82.8	80.2	67.9	51.1	43.5	61.8	100	12
Keene	41.1	47.5	50.5	60.7	63.5	68.3	75.5	77.0	76.3	61.7	50.8	48.9	60.2	102	16
Kingsbury	41.3	48.5	52.7	70.2	67.9	74.7	84.4	86.2	82.1	68.0	55.2	48.8	65.0	114	20
Knights Landing	41.3	50.5	51.0	60.3	66.3	67.2	74.3	73.6	74.0	64.5	53.6	48.8	60.4	105	20
Lathrop	44.9	52.6	53.3	64.3	65.7	72.6	75.4	75.3	71.1	61.8	54.7	47.8	61.6	112	23
Laurel								70.1	68.8	62.9	54.7	53.0	61.9	—	—
Lemoore	43.8	50.6	53.6	66.8	65.2	74.6	82.8	83.4	82.8	66.0	52.7	46.9	64.1	113	18
Livermore	46.9	53.7	53.7	59.9	58.8	64.0	63.6	66.0	64.6	59.5	51.9	47.6	57.5	110	20
Livingston	48.2	56.4	57.8	68.3	70.6	74.9	86.3	82.9	79.6	67.4	55.9	49.2	66.5	111	21
Long Beach												—			
Los Angeles	50.0	54.4	55.1	61.9	60.8	67.5	67.9	67.6	68.4	62.0	57.2	55.2	60.7	99	31
Los Gatos									70.8	64.4	55.0	52.4	60.6	—	—
Mammoth Tank	49.6	59.4	63.0	82.0	82.6	93.4	97.2	96.0	93.9	78.6	61.3	52.0	75.7	117	27
Martinez	44.0	53.1	49.7	58.9	58.6	70.7	74.3	68.3	67.8	63.5	54.2	50.8	59.5	94	20
Marysville	54.5	57.5	63.9	70.4	70.2	78.8	81.3	81.4	77.6	67.4	52.7	47.7	67.0	106	20

Menlo Park	45.8	52.5	51.4	59.0	60.4	67.0	70.2	69.5	66.7	61.7	55.2	53.1	59.4	101	20
Merced	47.1	54.6	54.2	65.9	69.3	76.3	83.4	83.0	77.7	68.5	58.0	50.8	65.7	120	20
Modesto	44.2	50.8	54.4	66.2	66.1	73.4	80.9	86.6	80.7	64.7	52.7	50.4	64.3	110	19
Mojave	43.7	52.1	53.7	71.0	67.6	73.1	81.2	85.3	93.9	69.4	58.4	51.8	66.8	115	16
Montague	------	49.8	49.9	61.9	65.4	65.6	80.3	85.9	74.3	61.9	44.1	40.4	61.8	104	—
Monterey	49.7	54.8	54.6	57.5	60.0	64.8	64.6	63.1	62.5	59.5	53.7	55.2	58.2	90	20
Napa	44.6	49.5	51.8	56.4	60.4	69.8	69.3	67.2	65.8	60.4	52.7	51.0	58.2	100	21
Newark	------	------	------	------	------	------	------	68.6	68.4	65.0	58.1	53.6	62.7	—	—
Newhall	45.5	50.9	54.9	65.1	64.0	71.5	77.6	75.2	76.6	63.9	52.9	49.8	62.7	108	14
Newman	------	------	------	------	------	------	------	------	85.5	—	58.3	53.1	—	—	—
Niles	—	50.5	54.8	61.7	63.9	66.3	73.3	68.4	66.7	63.0	62.5	55.2	57.2	101	—
Norwalk	------	------	------	------	------	------	------	------	------	------	—	55.1	—	—	—
Oakland	47.4	52.6	51.0	57.6	57.0	62.9	62.5	61.4	60.8	69.1	54.2	52.1	56.6	80	28
Ontario	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Orland	44.5	54.8	53.9	69.0	70.7	75.3	85.1	85.5	84.3	74.8	57.5	51.1	67.2	115	22
Pajaro	47.1	53.1	52.1	56.0	58.3	63.1	63.5	61.4	62.3	60.8	55.6	55.8	57.4	89	20
Paso Robles	44.1	47.8	51.9	62.3	64.0	71.7	73.5	74.4	71.0	60.4	51.3	47.9	60.0	108	13
Petaluma	44.2	50.8	49.0	57.3	57.8	61.2	68.2	67.3	65.0	65.0	55.1	51.3	57.7	97	18
Placerville	------	------	------	------	------	------	74.5	73.2	71.4	57.9	49.9	46.8	62.3	103	—
Pleasanton	48.1	53.7	54.9	61.8	63.4	69.8	74.7	75.7	75.7	67.8	51.3	51.6	62.4	104	22
Pomona	------	------	------	------	------	------	------	------	------	------	—	59.2	—	—	—
Porterville	------	------	------	------	------	------	------	90.5	81.4	72.0	57.0	50.1	70.2	—	—
Puenta	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Red Bluff	40.9	53.9	54.5	67.0	68.1	70.7	80.9	83.6	81.2	68.2	54.8	48.3	64.3	109	18
Redding	39.2	52.4	55.3	69.6	74.2	72.5	83.0	80.9	81.5	66.4	48.5	53.9	64.8	106	18
Rocklin	42.7	49.8	52.5	59.7	64.0	70.2	79.9	82.1	78.4	66.8	55.0	48.5	62.5	106	20
Rumsey	------	------	------	------	------	------	84.1	84.6	82.4	70.9	56.2	50.8	71.5	110	—
Sacramento	42.8	52.6	53.6	62.3	61.8	67.7	71.6	75.4	73.7	64.2	53.6	48.4	60.6	108	19
Salinas	44.1	49.7	48.6	56.2	58.1	68.4	66.2	60.3	59.3	57.3	50.8	52.2	55.9	87	21
Sanger Junction	------	------	------	------	------	------	------	89.2	84.1	72.5	59.6	51.2	71.3	—	—
San Ardo	44.6	50.8	52.0	60.0	62.7	70.1	69.4	69.9	70.5	62.0	54.9	51.9	59.9	111	20
San Diego	51.6	54.9	55.8	60.8	61.2	65.9	68.4	68.4	68.2	63.5	58.8	56.5	61.2	93	33
San Fernando	44.6	52.4	55.6	69.5	62.1	75.1	76.4	74.9	76.7	68.2	58.6	55.1	64.1	108	28
San Francisco	46.3	52.8	52.5	56.2	55.4	61.0	59.1	57.8	59.0	58.6	55.1	52.4	55.5	93	29
San Gabriel	------	------	------	------	------	------	------	------	------	------	------	54.0	—	------	------
San José	46.4	52.6	52.8	58.3	59.8	65.2	66.8	68.6	68.0	62.3	56.5	52.9	59.2	93	22
San Mateo	46.5	51.2	51.7	58.3	58.2	67.1	69.7	66.7	62.8	58.1	49.3	50.6	57.5	92	26
San Miguel	43.2	52.5	54.5	61.2	62.2	69.5	69.9	73.2	70.5	62.5	54.4	50.9	60.4	106	17
San Pedro	------	------	------	------	------	------	76.2	77.3	75.0	69.2	62.1	59.1	69.8	90	—
Santa Ana	------	------	------	------	------	------	------	------	------	------	------	—	------	------	------
Santa Barbara	48.4	56.1	54.8	62.6	62.8	70.7	72.5	69.0	67.0	65.0	59.6	55.8	62.4	82	30
Santa Cruz	49.2	53.1	54.8	59.3	59.3	67.5	66.4	64.4	65.8	66.3	58.0	57.1	60.1	98	24
Santa Monica	56.8	58.0	57.2	65.3	64.0	68.0	76.7	74.6	72.6	67.8	60.5	55.8	64.8	91	39
Santa Paula	------	------	------	------	------	------	------	68.3	70.5	67.3	62.6	59.8	65.7	—	—
Santa Rosa	------	------	------	------	------	------	------	71.7	67.4	62.1	53.9	51.5	61.3	—	—

MONTHLY TEMPERATURE AT THE SOUTHERN PACIFIC STATIONS IN CALIFORNIA—Continued.

STATIONS.	January	February	March	April	May	June	July	August	September	October	November	December	Annual Means	Highest Observed	Lowest Observed
Selma	43.6	50.4	51.7	63.1	70.7	77.2	85.8	87.7	83.4	70.2	57.0	48.0	65.7	110	22
Seven Palms	------	------	------	------	------	------	------	------	------	------	—	55.9	------	—	—
Shingle Springs	------	------	------	------	------	------	------	73.9	77.7	60.0	50.0	—	—	—	—
Sims	—	—	53.7	66.1	72.4	71.7	83.5	88.4	79.1	69.8	53.9	41.0	68.0	105	—
Sisson	—	—	43.4	60.3	45.4	57.1	66.1	69.2	63.1	53.4	44.6	41.0	54.4	104	—
Soledad	42.1	50.4	50.5	59.2	57.6	63.6	64.8	63.7	63.2	58.1	51.1	49.1	56.1	104	16
Soquel	50.3	52.2	53.6	59.6	61.0	68.4	69.5	63.7	61.5	61.3	51.5	55.0	59.0	94	18
South Side	46.0	52.3	51.5	63.5	61.5	70.0	77.2	78.2	80.1	65.2	56.0	52.1	62.8	110	26
South Vallejo	44.4	—	53.4	57.0	57.8	63.7	66.6	68.6	66.9	63.2	56.0	50.2	58.9	95	24
Spadra	49.1	52.2	51.0	61.8	62.7	70.8	69.8	68.4	67.7	61.3	56.6	53.1	60.4	110	27
Stockton	44.3	51.1	53.6	62.3	62.0	68.1	71.1	74.9	72.3	62.2	53.3	49.6	60.4	102	24
Suisun	44.7	51.9	56.9	63.5	61.7	68.3	71.1	72.5	71.9	65.7	58.7	54.1	61.8	105	27
Summit	22.4	30.9	30.5	40.7	45.9	50.1	60.0	59.6	59.7	48.7	35.5	31.7	43.0	81	—12
Sumner	46.5	54.9	57.7	73.5	75.7	83.2	91.7	89.4	86.5	68.4	—	—	72.8	110	20
Tehama	41.1	54.6	54.7	65.9	65.4	68.6	78.8	81.1	72.7	64.5	57.9	55.0	63.4	110	21
Tehachapi	32.9	41.3	46.2	54.7	61.4	—	—	—	68.4	49.7	42.7	39.0	48.5	—	2
Templeton	46.0	54.0	54.4	61.8	61.2	69.8	71.2	73.7	70.4	60.3	52.6	50.3	60.5	107	15
Towles	34.5	46.4	49.3	53.9	60.9	55.0	69.0	60.8	62.6	54.1	51.3	43.2	53.4	95	8
Tracy	47.6	51.4	52.5	65.4	68.3	72.6	75.4	78.9	73.2	64.5	57.3	50.2	63.1	106	20
Traver	—	—	54.8	65.2	76.4	83.0	89.0	85.5	81.4	69.0	57.4	43.2	70.5	106	—
Tropico	48.3	52.7	55.7	64.3	65.7	71.8	74.0	72.5	74.5	63.7	55.3	53.1	62.6	102	26
Truckee	20.2	29.6	53.6	46.5	51.6	56.0	67.3	64.9	61.6	50.6	39.3	34.0	47.9	88	—30
Tulare	44.0	51.5	57.0	73.0	75.0	80.5	86.4	85.0	81.1	71.6	61.7	50.2	68.1	113	18
Turlock	45.7	53.2	55.9	64.6	67.0	74.1	78.2	81.6	76.5	65.2	54.6	53.1	64.1	109	21
Vacaville	------	------	------	------	------	------	------	—	80.4	73.4	62.8	51.6	67.0	—	—
Vina	------	------	------	------	------	------	------	------	72.8	66.0	54.4	50.8	61.0	—	—
Volcano Springs	------	------	------	------	------	------	------	------	------	------	—	52.2	------	—	—
Westley	------	------	------	------	------	------	------	84.1	78.7	69.0	58.7	54.9	69.1	—	—
Whittier	------	------	------	------	------	------	------	76.1	79.9	72.1	61.7	55.4	69.0	—	—
Williams	46.1	53.4	52.6	64.1	68.9	79.0	87.7	82.9	84.8	74.3	55.1	47.9	66.4	110	19
Willows	40.3	51.1	51.6	64.1	67.2	70.9	79.8	78.8	84.2	67.8	52.5	47.6	63.0	105	20
Winters	------	------	------	------	------	------	83.2	84.5	82.4	72.4	60.7	51.3	72.4	109	—
Woodland	43.2	46.1	48.1	51.7	62.5	67.3	73.4	76.1	74.6	68.8	58.3	50.1	60.0	102	18

California's Rainfall for 1888.—The rainfall for each month of the year 1888, in California, from the records of the Southern Pacific Railroad Company, voluntary observers, military posts, and from those of the Signal Service Station not otherwise accounted for in this publication:

Stations.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Normal or Average Precipitation.
Crescent City	22.46	3.52	5.86	1.42	1.04	7.30	.02	.00	.00	.08	2.47	2.99	58.40	83.45
Crescent City	22.46	3.25	4.55	3.13	.65	6.49	.00	.00	.00	2.04	4.92	7.19	54.68	-------
Fort Bidwell	3.28	1.81	3.28	.16	1.50	2.38	.34	.04	.33	.20	.63	.16	14.11	20.20
Fort Gaston	12.58	5.18	4.32	.70	1.18	4.20	.30	.00	.00	.61	2.08	4.55	35.70	45.69
Humboldt	12.39	1.30	3.79	.65	.85	4.22	.37	.00	.04	.89	2.84	6.20	33.52	33.59
Eureka	12.95	1.98	4.09	1.05	.76	4.66	.44	T.	.06	1.15	3.41	5.73	36.48	40.79
Upper Matole	41.63	4.13	8.96	1.51	.48	4.19	.11	T.	.00	1.06	4.86	13.62	80.55	-------
Redding	9.35	2.70	2.95	.00	.73	3.52	.00	.00	.45	.00	-------	7.43	-------	-------
Tehama	4.70	2.40	4.10	.25	.25	.30	.00	.00	.00	.00	3.61	8.33	23.94	14.65
Corning	3.64	2.09	3.20	.19	.40	.79	T.	.00	.52	.00	3.34	5.37	19.44	14.95
Chico	4.95	1.15	1.94	.15	.00	1.20	.00	.00	.68	.00	4.49	5.35	19 81	19.31
Orland	4.11	1.56	2.73	.57	.24	.53	.00	.00	.27	.00	2.79	3.47	16.27	14.12
Williams	2.22	.70	1.72	.00	.67	.08	.04	.02	.50	.00	4.10	2.67	12.72	11.77
Westport	16.61	2.04	4.83	.73	.79	5.61	.22	T.	.40	.22	-------	-------	-------	-------
Point Arena	11.41	1.29	2.95	.25	.75	2.70	.36	.00	.54	.15	3.33	5.78	29.51	27.17
Truckee	3.43	12.50	.16	.00	2.04	.37	.40	T.	.00	.00	.00	4.80	23.70	23.70
Emigrant Gap	17.05	3.92	5.42	3.30	2.33	3.04	.62	.00	.10	.00	4.77	7.39	47.94	51.96
Colfax	13.28	2.18	3.80	.95	.17	2.69	.00	.00	.25	.10	3.28	9.57	35.27	43.98
Auburn	7.07	1.40	3.25	.80	.40	1.55	.00	.00	.00	.00	4.20	5.82	24.49	32.40
Rocklin	4.39	.76	2.05	.00	.53	?	.05	.00	.00	.00	2.73	3.94	15.05	21.16
Dunnigan	4.18	1.03	3.39	.00	1.62	.00	.00	.00	.59	.00	5.88	4.59	21.28	16.07
Davis	4.23	1.10	2.80	.30	.50	.00	.00	.00	.65	.00	5.06	4.10	18.74	16.55
Knights Landing	4.18	.91	2.51	.07	2.45	.34	.02	.00	.81	.00	5.72	4.82	21.83	17.75
Calistoga	7.87	2.87	5.64	.26	.20	1.16	.00	.00	.89	.00	6.14	6.91	31.94	31.00
Napa	4.87	1.33	4.18	.88	.65	.00	.00	.00	.49	.00	2.96	5.30	20.66	23.25
Sonoma	5.78	.70	4.55	.19	1.42	.73	.00	.00	.86	.00	5.02	8.30	27.55	25.82
Petaluma	3.72	2.10	4.85	.36	1.00	.30	.00	.00	1.24	.00	4.37	5.83	23.77	21.83
Ione	4.60	5.12	1.16	.70	.22	.00	.00	.00	.36	.00	2.99	2.48	17.63	19.34
Brighton	4.67	.62	2.86	.30	.59	?	.00	.00	.52	.00	3.94	8.29	21.79	15.72
Galt	3.97	.46	3.14	.40	.39	.35	.00	.00	.92	.00	3.87	3.14	16.64	15.34
Elmira	4.81	1.49	3.92	T.	.45	.19	.00	.00	.08	.00	.28	4.47	15.69	16.51
Suisun	4.30	1.58	3.97	.00	.65	.30	.00	.00	.70	.00	3.88	4.48	19.86	18.32
South Vallejo	4.52	1¼?	.62	.00	.45	.16	.00	.00	.40	.00	3.12	3.01	13.53	14.90
Benicia Barracks	5.84	.47	4.32	T.	.33	.38	.01	.00	.90	.00	2.92	3.82	18.99	15.94
Angel Island	5.36	.30	1.18	.04	.13	.13	T.	.00	1.15	T.	2.84	4.61	15.74	22.66
Point Bonita Lighthouse	6.96	1.46	3.85	.28	.63	.45	.00	.00	1.94	.40	5.52	6.73	28.22	25.09
Martinez	4.24	1.65	3.54	.00	.10	.15	.00	.00	.65	.00	3.06	2.91	16.30	16.75

CALIFORNIA'S RAINFALL FOR 1888—Continued.

STATIONS.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.	Normal or Average Precipi'tion.
Antioch	2.84	1.24	2.05	.00	.50	.00	.00	.00	.70	.00	1.82	2.88	12.03	11.07
Brentwood	4.24	.40	2.28	.02	.59	.00	.00	.00	.82	.00	3.71	1.72	13.78	11.05
East Brother Lighthouse	2.15	.24	.87	.00	.05	.06	.00	.00	.70	.00	3.40	2.50	9.97	7.31
Byron	2.67	1.25	1.77	.00	.75	.00	.00	.00	.59	.00	4.49	1.81	13.33	12.11
Walnut Creek	4.35	.90	.65	08	.00	.00	.00	.00	.40	.00	3.00	2.34	11.72	-------
Niles	4.10?	.30	2.83	.23	.60	.50	.00	.00	.42	.00	3.70	2.30	14.98	17.05
Livermore	3.20	.94	2.54	.60	.66	.30	.00	.00	.64	.00	3.80	2.21	14.89	13.69
Pleasanton	3.23	.88	2.25	.20	.50	.27	.00	.00	.62	.00	5.15	1.85	14.95	17.85
Centerville	3.99	1.80	3.07	.15	.78	.40	.00	.00	.39	.07	3.87	2.53	17.05	16.15
Berkeley	5.84	1.92	4.50	1.95	.42	.43	.05	.00	.59	.02	2.71	3.79	22.22	-------
Stockton	3.00	.58	1.74	.55	.54	.00	.00	.00	.31	.00	2.66	2.71	12.09	11.96
Farmington	3.82	.15	3.52	.07	.92	.00	T.	.00	.66	.00	2.93	1.75	13.82	14.78
Tracy	1.99	.84	.61	.00	.54	.19	.00	.00	.35	.00	2.85	1.71	9.08	9.15
Lathrop	2.46	.41	1.09	.49	.72	.00	.00	.00	.78	.00	2.60	3.21	11.76	11.64
LaGrange	2.84	.66	2.63	.17	.52	T.	.04	T.	.32	.00	3.29	3.67	14.14	16.21
Modesto	1.72	.53	1.36	.25	.69	.10	.00	.00	.51	.00	1.86	1.40	8.42	9.20
Turlock	2.19	.19	1.11	.18	.52	.00	T.	.00	.82	.00	2.75	1.28	9.04	9.53
Farallone Islands	3.20	.53	2.59	.00	.05	.16	.00	.00	.35	.05	3.30	4.56	14.79	17.91
Yerba Buena Lighthouse	5.10	1.29	2.92	.00	.41	.05	.00	.00	.06	.00	2.47	3.13	15.43	16.95
San Mateo	4.75	1.21	3.97	.13	.67	.08	.00	.00	1.03	.00	4.16	4.04	20.02	22.75
Menlo Park	3.17	1.36	2.31	.02	.37	.09	.00	.00	.98	.00	3.72	2.59	14.61	14.42
Point Montara Lighthouse	5.63	1.56	4.59	.01	.43	.53	.00	.00	.95	.21	4.30	6.19	24.40	23.49
Pigeon Point Lighthouse	5.49	1.04	3.80	.00	1.52	.26	.00	.00	.00	.00	-------	-------	-------	16.22
Año Nueva Lighthouse	7.22	.84	4.72	.08	.98	.30	.00	.00	.05	.00	4.55	4.25	22.99	21.10
Santa Cruz	8.00	1.93	4.61	.57	1.08	.09	.00	.00	.37	.00	6.17	5.07	27.89	24.87
Aptos	5.85	1.59	5.32	.50	.79	.25	.00	.00	.45	.00	5.75	4.31	24.81	21.47
San José	3.06	1.06	3.00	.31	.60	.22	.00	.00	.60	.00	3.88	2.44	15.17	15.35
Gilroy	5.35	.77	3.92	.40	.44	.00	.00	.00	.32	.00	3.71	2.10	17.01	19.18
Los Gatos	5.73	1.47	6.74	.07	1.00	.38	.00	.00	.59	6.19	3.88	4.40	30.45	-------
Santa Clara	3.08	1.68	3.10	.12	1.28	.18	.00	.00	.58	.00	4.37	3.00	17.39	13.93
Evergreen	2.61	1.44	3.32	.08	.81	.24	.00	.00	.57	.00	2.82	2.07	13.96	-------
Merced	1.50	.15	1.68	.28	.65	.10	.00	.00	.50	.00	2.40	2.12	9.38	10.73
Los Banos	1.83	.06	1.33	.00	.19	T.	T.	T.	.60	.00	2.99	1.92	8.92	7.23
Livingston	2.79	.29	2.57	.26	.22	.00	.00	.00	?	.00	3.80	2.10	12.03	8.10
Athlone	2.29	.15	1.70	.30	.60	.00	.00	.00	.25	.00	2.56	1.59	10.10	9.49
Lemoore	1.89	.00	1.28	.00	.88	.00	.00	.00	.00	.00	2.04	.96	7.05	9.05
Kingsburg	2.29	.29	1.64	.00	.21	.00	.00	.00	.08	.00	1.78	1.83	8.12	8.90
Selma	2.40	T.	1.57	.10	.31	.00	.00	.00	.10	.00	1.46	1.88	7.82	7.78

Bishop Creek	1.25	.47	.92	.05?	.00	.35	.20	.00	.00	.00	1.72	.40	5.69	2.94
Keeler	.70	1.21	.30	.12	.30	.20	.17	.10	.06	.00	1.68	.82	5.66	3.67
Hollister	2.61	.97	2.75	.40	.80	.02	.00	.00	.20	.00	2.20	2.00	11.95	11.52
Monterey	3.95	1.09	3.29	.23	.81	.00	.09	.00	.65	.00	1.76	2.76	14.54	14.45
Soledad	2.86	.88	2.10	.15	.35	.00	.00	.00	.25	.00	2.03	1.73	10.35	8.75
Pajaro	4.59	.91	4.27	.47	.58	T.	.00	.00	.79	.00	3.29	2.80	17.70	18.13
Jolon	5.64	.16	4.81	.00	.37	.01	T.	.00	.60	.00	5.64	4.48	21.71	20.26
Traver				T.	.11	.00	.00	.00	.18	.00	2.33	2.20		
Goshen	2.11	.19	1.33	.12	.29	.00	.00	.00	.16	.00	2.25	1.12	7.57	7.78
Tulare	1.14	.19	1.14	.00	1.11	.00	.00	.00	.18	.00	1.66	1.38	6.81	6.77
Lewis Creek	4.09	.46	2.29	.10	.13	.00	?	.00	.07	.00	2.57	2.87	12.58	11.93
Templeton	6.05	.32	5.00	.38	.34	.04	.00	.00	.07	.00	4.53	3.20	19.93	
San Ardo	3.44	.28	2.91	.11	.27	.00	.00	.00	.00	.00	3.24	2.31	12.46	
Steeles	8.60	.49	3.44	.36	.46	.00	.00	.00	.05	.00	5.45	3.35	22.20	
Delano	2.21	.10	.94	.00	.15	.00	.00	.00	.00	.00	1.51	1.19	6.10	5.44
Caliente	.87	1.14	1.50	.00	.81	.00	.00	.00	.00	.00	1.33	2.18	7.83	10.67
Keene	1.30	1.70	2.69	.78	2.03	.00	.68	.00	.00	.00	1.28	2.29	12.75	13.32
Tehachapi	2.57	2.60	2.57	1.25	.25	.00	.00	.00	.00	.00	?	3.65		11.43
Mojave	2.61	1.50	1.75	.00	.00	.00	.00	.00	.00	.00	2.18	2.23	10.27	4.22
Colton	4.89	.42	3.68	.43	.00	.00	.00	.00	.00	.00	2.37	3.26	15.05	9.53
Ravenna	2.57	.82	3.19	.00	.00	.00	.00	T.	.00	.75	2.35	2.90	12.58	11.83
Newhall	6.74	1.17	4.21	.29	.04	.00	.00	.00	.00	.40	3.69	5.64	22.18	14.90
San Fernando	5.09	1.39	3.40	.44	.00	.00	.00	.00	.00	.36	3.23	5.40	19.31	14.80
Cahuenga Valley	7.55	1.13	3.67	.15?	.08	.00	.00	.00	.00	.71	4.38	6.47	24.14	18.55
Anaheim	6.29	.92	5.90	T.	.00	.00	.00	.00	.00	T.	3.75	4.19	21.06	10.84
Santa Monica	6.98	.00	6.95	.60	.00	.00	.00	.00	.00	.58	5.09	6.49		
Spadra	6.23	.98	3.45	.00	.00	.00	.00	.00	.00	.25	1.50	3.48	15.89	12.27
Downey	5.33	.82	5.52	.11	.02	.00	.00	.00	.00	.01	2.94	4.75	19.50	12.77
Santa Maria	4.62	.43	2.55	.12	.14	T.	T.	.00	T.	T.	2.59	5.86	16.31	14.94
Point Concepcion	6.49	.90	3.65	.00	.00	.00	.00	.00	.00	.00	1.23	3.06	15.03	11.40
Indio	.75	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.10	1.11	2.96	1.90
Mammonth Tank	.05	.07	.05	.03	.01	.00	.40	.00	.00	.43	.73	.87	2.63	1.99
Elsinore	6.09	.80	.09	5.87	?	.00	.20	.00	.06	.69	2.93	5.37	22.10	

The following record shows the average rainfall for each month in the year, along with the yearly average, and the greatest amount that has ever been precipitated during any season, as also the least amount. This data is taken from a report published by General A. W. Greeley, the Chief Signal Officer, entitled "Rainfall in California, etc., for from Two to Forty Years." All stations in California will be found in the tabulated statement below, numbering over two hundred and forty different stations, and is valuable, because it is an average obtained from many years of observation:

Name of Station.	January	February	March	April	May	June	July	August	September	October	November	December	Yearly Average.	Greatest Seasonal Precipitation	Least Seasonal Precipitation
Camp Lincoln	16.87	6.68	11.20	7.16	.92	3.15	.02	.05	.30	1.82	9.48	15.58	73.23		
Crescent City	13.69	10.44	6.29	8.58	2.75	2.31	.65	.08	3.49	10.22	11.37	18.90	88.77	113.45	69.72
Fort Terward	9.97	8.78	4.51	6.07	3.63	.18	2.42	.71	4.57	4.52	12.71	11.52	69.59		
Yreka	3.19	1.75	1.55	1.04	.83	.39	.26	.08	.37	1.46	1.77	2.52	15.21	22.48	10.53
Scott Valley	4.84	2.93	2.52	1.84	.98	.46	.49	.20	.50	1.24	3.15	4.96	24.11	40.96	13.05
Fort Jones	2.88	4.10	2.77	1.25	1.21	.69	.06	.07	.20	1.39	2.59	4.39	21.60	32.03	18.89
Berryvale	3.67	2.00	5.94	3.90	.30	.00	.00	.00	1.19	3.48	3.27	5.09	28.84		
Almaden	1.52	8.60	.92	1.60	.00	.00	.00	.00	.20	.05	.60	.80	14.29		
Fort Bidwell	4.24	2.71	2.25	1.68	1.37	1.13	.31	.20	.38	.96	2.08	3.46	20.77	37.20	12.24
Little Hot Springs	5.53	2.81	3.00	1.73	1.51	.76	.79	1.60	.00	2.81	4.45	2.14	27.13		
Fort Gaston	10.56	7.99	7.50	4.70	1.74	.75	.12	.11	.89	2.67	7.69	10.70	55.42	125.36	31.72
Blue Lake	12.66	7.34	3.98	8.14	2.08	1.04	.47	T.	2.08	1.91	16.68	20.08	76.46		
Arcata	5.85	6.07	3.08	7.38	1.32	.00	.00	.00	.00	3.19	1.77	9.03	37.69		
Fort Humboldt	5.78	5.96	5.30	2.82	1.24	.47	.19	.07	.58	1.78	4.13	7.59	35.91	47.43	23.11
Humboldt Lighthouse	6.28	4.64	4.46	3.56	1.08	.36	.03	.04	.62	2.07	4.04	5.84	33.02	48.76	20.62
Hydesville	5.91	3.76	3.47	5.73	.93	.54	.14	.01	.87	1.69	5.68	8.42	37.15	55.70	26.81
Cape Mendocino	2.68	1.89	1.90	3.15	.74	.58	.31	.28	.91	1.88	2.52	2.76	19.60	27.74	11.94
Orleans	8.66	3.78	2.10	5.76	1.02	.46	.32	.00	.08	1.82	9.49	11.16	44.65		
Weaverville	8.21	5.75	4.72	3.83	1.75	.93	.13	.05	.54	2.85	5.95	7.74	42.45	65.22	24.72
Fort Crook	3.16	3.33	3.52	1.59	1.25	.57	.25	.01	.39	1.06	2.81	5.38	23.32	40.36	13.19
Delta	6.65	3.56	7.03	8.66	4.55	2.03	.05	.00	.02	4.54	6.70	9.21	53.00	75.24	33.30
Reed's Camp	12.40	7.48	11.45	10.88	3.75	1.95	.06	.00	.57	5.63	3.72	12.06	69.95	95.46	55.27
Redding	7.07	4.98	3.91	3.66	1.45	.45	.05	.06	.37	1.89	3.62	6.74	34.25	59.92	8.78
Fort Redding	4.88	3 27	3.91	3.92	2.85	.31	T.	.06	.16	.69	3.20	5.78	29.03	40.63	16.07
Red Bluff	5.97	3.87	2.54	2.18	.78	.37	T.	.05	.41	1.22	2.84	3.76	23.99	61.65	13.52
Tehama	2.70	2.37	1.64	1.37	.54	.24	.05	.06	.18	.74	1.91	2.12	13.92	29.82	5.16
Corning	3.16	2.90	2.09	2.08	.44	.02			.23	.94	1.25	2.06	15.17		
Meadow Valley	7.41	6.05	6.21	3.20	1.99	1.09	2.40	1.13	1.53	2.41	12.10	11.52	57.04		
Mumford Hill	13.08	12.33	10.71	7.56	2.96	.57	.14	.32	.69	2.23	4.10	11.12	65.81	80.45	59.01
Camp Wright	8.92	6.50	5.22	1.95	.77	.22	.01	.02	.40	1.20	6.53	11.41	43.15	69.87	19.86
Laytonville	6.73	2.45	3.29	4.98	.24	.34	.92	.00	.34	1.06	7.10	10.16	37.61	40.55	34.98

Westport	4.40	3.54	2.52	4.57	1.38	.31	.05	T.	.88	2.38	10.37	7.44	37.84	-------	-------
Mendocino	9.90	8.90	7.36	4.77	1.31	.39	.08	.05	.45	2.60	5.51	7.96	49.28	80.97	29.19
Ukiah	6.88	4.78	4.57	3.52	.98	.12	.00	.01	.48	1.43	3.94	6.21	32.92	54.88	19.88
Point Arenas	5.90	5.16	4.84	3.23	.82	.22	.01	.01	.32	1.73	3.55	4.74	30.53	53.24	17.35
Orland	1.98	2.05	2.07	1.79	.66	.34	.00	T.	.19	.64	2.05	3.30	15.07	-------	-------
Willows	1.99	1.37	1.30	1.89	.39	.12	T.	.01	.13	.59	1.46	2.51	11.76	18.84	6.47
Princeton	2.98	2.22	1.67	1.53	.55	.45	.09	.08	.08	.25	1.02	2.60	13.52	26.30	10.20
Little Stony	2.50	1.04	.55	2.63	.00	.58	.00	.00	.00	.27	13.29	3.51	24.37	-------	-------
Colusa	3.67	2.82	1.86	1.54	.45	.37	.04	.02	.19	1.04	1.82	3.17	16.99	32.84	9.20
Foutz Springs	5.64	4.04	2.93	4.68	.25	T.	.00	.00	.00	.45	9.81	3.84	31.64	-------	-------
Williams	2.55	1.75	1.34	1.51	.39	.46	.00	.01	.13	.43	1.15	1.99	11.71	21.64	3.94
College City	2.30	0.91	3.01	1.62	.08	1.12	.00	T.	.37	.80	3.07	2.30	15.58	-------	-------
Cantaloupe Valley	5.16	2.71	3.07	2.19	.82	.24	.00	.00	.25	.54	3.02	4.92	22.92	-------	-------
Chico	3.92	3.57	2.28	1.73	.71	.34	.03	.03	.27	1.02	2.39	3.77	20.06	34.72	12.91
Cherokee	8.37	7.55	7.95	3.37	1.47	.60	.11	.06	.51	2.95	5.40	6.59	44.93	63.26	28.35
Oroville	3.49	3.11	1.25	2.42	.29	.10	T.	T.	.57	.80	3.34	9.46	24.83	31.21	18.46
Cherokee Reservoir	13.35	9.95	11.69	3.78	2.06	.72	.30	.23	.54	4.08	7.80	5.77	60.27	78.78	42.34
Smartsville	7.11	5.70	4.48	3.16	.88	.44	.05	.00	.11	1.50	3.74	5.01	32.18	46.78	17.99
Marysville	3.28	2.46	1.84	1.63	.59	.25	.01	.01	.19	.89	1.74	3.33	16.22	26.86	6.65
North Bloomfield	9.37	7.81	7.58	5.73	2.04	.64	.12	.02	.60	2.90	5.84	9.83	52.48	74.52	27.87
Bowman's Dam	14.00	11.07	10.77	7.78	2.59	.83	.20	.02	.71	3.65	7.94	14.00	73.56	102.22	44.37
Boca	4.26	3.43	2.68	1.51	.40	.13	.24	T.	.02	.57	.91	2.72	16.87	23.40	8.05
Truckee	5.98	5.84	4.16	2.67	1.05	.39	.21	.02	.07	1.24	2.11	4.35	28.09	47.21	13.88
Nevada City	10.93	7.68	8.57	5.14	2.06	.60	.04	.03	.54	1.82	6.77	12.09	56.27	115.26	17.28
Grass Valley	10.03	7.10	7.57	5.61	1.90	.62	.05	.01	.69	2.81	6.06	8.17	50.62	65.32	30.23
Middletown	7.78	3.44	4.79	6.97	1.23	.51	.00	.00	.49	1.43	4.94	10.41	41.99	52.04	28.43
Kono Tayee	4.86	3.34	3.68	1.16	.52	.29	.00	.01	.19	1.02	4.21	2.53	21.81	31.96	12.08
West Butte	2.50	1.13	2.18	2.57	.85	.32	.00	.00	.32	.73	1.83	2.67	15.10	19.80	12.13
Nicolaus	3.52	2.88	2.60	3.12	.60	.13	.00	T.	.22	.90	1.98	3.28	19.23	26.76	8.93
Summit	8.39	8.96	6.78	5.77	1.68	.62	.08	.01	.19	2.34	2.82	7.32	44.96	87.99	23.34
Emigrant Gap	10.18	9.50	8.77	5.65	2.47	.74	.02	.01	.32	2.45	3.25	8.13	51.49	85.17	18.64
Cisco	10.83	10.74	8.79	5.22	2.36	.79	.11	.00	.28	2.17	4.56	9.25	55.10	80.46	34.00
Alta	8.56	7.26	6.92	3.67	1.38	.51	T.	.00	.34	2.17	4.81	6.52	42.14	69.70	17.24
Colfax	8.36	6.77	6.28	4.97	1.63	.52	.00	.00	.32	1.74	5.06	7.67	43.33	60.06	27.61
Auburn	6.13	5.23	4.49	3.76	1.18	.36	.02	.01	.34	1.42	3.49	5.94	32.37	44.87	17.50
Rocklin	3.95	2.97	2.56	2.10	.65	.22	.02	.01	.10	.80	1.74	3.59	18.71	26.06	10.26
Dunnigan	3.52	2.22	2.08	1.89	.63	.28	.00	.00	.15	.61	1.56	2.80	15.74	29.50	3.48
Knights Landing	2.11	2.57	1.88	2.47	.64	.21	.00	T.	.11	.39	1.48	2.50	14.36	24.08	9.67
Woodland	3.36	2.48	2.07	1.84	.54	.15	.01	.00	.08	.54	1.17	2.98	15.22	25.32	5.13
Davisville	3.23	2.23	1.83	1.60	.38	.15	.01	T.	.10	.62	1.52	3.75	15.42	24.50	8.66
Georgetown	11.69	8.52	8.78	7.20	2.30	.82	.06	T.	.46	3.47	6.18	9.94	58.82	81.24	40.48
Placerville	7.10	6.05	5.79	7.69	1.88	.84	T.	T.	.71	2.19	3.75	8.67	44.67	61.81	22.67
Shingle Springs	7.72	3.71	5.14	3.19	1.13	.19	.19	.00	.23	.78	4.46	7.52	34.26	81.80	17.18
Healdsburg	5.52	9.31	2.28	.95	.39	.08	.00	.02	.24	.11	1.81	15.22	35.93	-------	-------
Sonoma	4.89	6.02	1.15	3.54	.29	.00	T.	.00	T.	.95	6.83	3.41	27.08	-------	-------

RAINFALL FOR EACH MONTH IN THE YEAR, ETC.—Continued.

NAME OF STATION.	January	February	March	April	May	June	July	August	September	October	November	December	Yearly Average	Greatest Seasonal Precipitation	Least Seasonal Precipitation
Petaluma	4.75	3.82	2.51	2.11	.53	.27	T.	T.	.12	.95	2.50	4.23	21.79	39.17	12.75
Calistoga	6.83	5.20	4.29	3.11	.79	.31	.00	.00	.23	1.78	3.06	4.89	30.49	50.20	7.33
Napa City	5.36	3.82	2.89	2.48	.76	.27	.01	.00	.43	.67	1.78	3.62	22.09	33.64	9.30
Knoxville	4.06	8.09	11.72	6.19	.16	.00	.00	.00	.00	1.92	.85	1.54	34.53	-------	-------
Folsom	4.48	3.28	3.14	2.91	.84	.72	.02	T.	.20	1.09	2.63	4.59	23.90	35.04	9.90
Sacramento	3.71	2.77	2.95	1.90	.67	.12	.03	T.	.12	.66	2.12	4.53	19.41	36.36	4.71
Camp Far West	6.92	1.26	12.70	4.46	.86	.00	.00	.00	2.30	.10	3.96	8.64	41.20	-------	-------
Brighton	2.83	3.16	2.52	2.89	.52	.20	.00	.00	.12	.61	1.46	2.22	16.53	24.42	9.22
Galt	2.76	2.44	2.37	2.31	.74	.18	.00	.00	.09	.77	1.27	2.44	15.37	19.35	9.61
Ione	2.88	3.28	3.06	3.39	.81	.30	.00	.00	.18	.91	1.67	2.86	19.34	29.73	13.04
Sutter Creek	6.56	4.91	4.90	4.78	1.33	.44	.03	.02	.26	1.80	3.88	4.28	33.19	-------	-------
Jackson	5.18	4.69	4.88	5.17	1.24	.32	.00	.00	.42	1.66	3.04	4.86	31.46	37.90	21.20
Winters	5.95	.14	1.77	3.90	.16	.00	.00	.00	.00	.00	8.74	4.74	25.40	-------	-------
Elmira	4.51	3.55	.95	3.14	.07	.00	.00	.00	.00	.19	.38	2.72	15.51	-------	-------
Vacaville	5.02	3.62	3.34	4.31	1.03	.00	.01	.00	.21	1.18	3.11	7.63	29.46	45.00	20.44
Denverton	4.33	2.29	2.53	1.87	.56	.29	.01	T.	.14	.98	2.43	2.51	17.94	-------	-------
Suisun and Fairfield	4.20	2.78	2.32	1.74	.53	.26	.00	.00	.26	.69	1.90	4.67	19.35	31.50	6.98
Rio Vista	3.08	1.54	2.78	2.34	.75	.21	.00	.01	.20	.80	2.07	3.16	16.94	-------	-------
South Vallejo	3.04	2.23	2.42	2.19	.47	.18	.00	.00	.10	.65	1.55	2.69	15.52	26.16	7.48
Bird's Landing	2.68	1.78	3.19	1.21	.00	.00	.00	.01	.05	.84	3.72	1.36	14.84	-------	-------
Benicia Barracks	3.16	2.27	2.38	1.69	.49	.16	.01	.01	.07	1.49	1.78	3.27	16.78	28.17	5.24
Point Reyes	4.29	3.24	3.94	4.06	.76	.20	.00	.00	.30	1.37	3 81	6.12	28.09	-------	-------
San Rafael	8.69	4.96	5.45	3.94	1.19	.40	T.	.00	.34	2.30	4.68	7.03	38.98	56.40	19.22
Ross Valley	7.81	2.91	6.44	6.30	.16	1.40	.00	.00	.17	1.84	5.51	10.55	43.09	-------	-------
Sausalito	3.91	2.18	3.50	3.71	1.06	.60	.02	.00	.26	1.65	4.21	5.13	26.23	32.86	19.62
Angel Island	4.61	3.28	2.81	2.33	.47	.24	.01	T.	.14	1.04	2.51	3.97	21.41	32.54	10.93
Point Bonita	5.04	3.83	3.89	2.49	.97	.39	.03	.00	.25	1.70	3.15	3.73	25.47	38.74	16.28
Alcatraz Island	3.90	2.86	1.95	1.48	.38	.17	.01	.01	.08	.61	1.87	3.66	16.98	29.65	7.69
Fort Point	4.07	2.95	1.90	1.20	.56	.02	.01	.00	.05	.56	1.67	4.37	17.36	-------	-------
San Francisco	5.06	3.76	3.07	2.04	.62	.15	.02	.02	.16	.85	2.85	5.20	23.80	49.27	7.40
Yerba Buena Island	2.59	2.09	2.23	2.18	.45	.27	.01	T.	.23	.88	1.82	3.40	16.15	27.30	6.13
Presidio	3.80	3.30	2.34	1.84	.53	.18	.02	.00	.11	.66	2.09	4.26	19.13	34.84	8.08
Farallone Islands	2.97	2.09	2.35	2.23	.74	.50	.00	.00	.18	1.06	2.52	3.54	18.18	26.15	10.54
Point San José	3.03	2.68	1.52	1.08	.38	.09	T.	.00	.03	.58	1.91	3.07	14.37	-------	-------
Antioch	1.66	1.52	1.69	1.46	.39	.13	T.	T.	.07	.42	1.29	1.10	9.73	18.35	5.69

Martinez	2.70	2.80	2.68	2.43	.45	.22	.01	.00	.11	.53	1.44	2.65	16.02	23.35	10.23
East Brother Island	1.71	.99	.86	.74	.26	.11	.00	.00	.04	.30	1.45	1.01	7.47	11.36	4.56
Brentwood	2.08	1.55	1.61	1.68	.27	.23	.00	.00	.06	.32	1.21	1.75	10.76	16.76	6.77
Mt. Diablo	5.16	3.44	.58	.22	.29	.22	.00	.00	.00	.57	4.73	1.06	16.27	23.76	11.40
Byron	2.11	1.59	1.84	1.86	.32	.22	.00	.00	T.	.49	1.31	2.28	12.02	18.25	7.34
Farmington	1.82	1.93	2.12	2.77	.64	.21	.00	T.	.16	.68	1.21	2.15	13.69	23.34	2.44
Stockton	2.67	2.46	2.14	1.65	.55	.15	.01	.00	.05	.50	1.11	2.62	13.91	22.04	6.87
Lathrop	1.94	1.88	1.54	1.82	.57	.14	T.	.00	.08	.38	1.19	1.65	11.19	16.35	5.41
Ellis and Tracy	1.63	1.44	1.23	.97	.24	.15	T.	.01	.01	.28	1.01	1.87	8.84	14.68	2.91
Oakland	4.71	3.46	3.35	2.38	.67	.44	.03	.02	.22	1.35	2.73	3.71	23.07	32.72	12.29
Livermore	2.51	2.45	2.15	1.49	.36	.16	T.	.01	.12	.51	1.43	2.62	13.81	22.75	6.01
Pleasanton	3.06	3.02	2.98	2.40	.58	.20	T.	.01	.08	.73	1.58	2.85	17.49	23.98	9.81
Niles	3.09	2.99	2.17	1.69	.59	.23	.00	.00	.10	.73	2.06	3.23	16.88	26.25	7.45
Midway	2.52	2.11	.50	.39	.06	.00	.00	.00	.00	.20	.29	.55	6.62	10.95	2.24
Calaveras Valley	3.79	4.28	5.47	5.33	1.85	.40	.00	.00	.26	1.42	1.68	2.35	26.83	37.30	21.40
Langworth	2.38	1.16	2.98	2.84	.12	.24	.00	.00	.16	.79	2.30	2.55	15.52	22.75	9.47
LaGrange	2.86	2.83	2.40	1.87	.65	.07	.00	.00	.16	.85	2.05	2.80	16.54	25.87	5.74
Modesto	1.72	1.21	1.19	1.14	.33	.11	.01	.00	.09	.40	1.06	1.54	8.80	13.54	2.25
Grayson	2.21	1.77	1.62	1.22	.44	.17	.00	.00	.01	.47	1.22	2.70	11.83	23.51	4.05
Turlock	1.05	1.40	1.35	1.61	.41	.25	.00	.00	.13	.46	1.17	1.04	8.87	15.09	4.28
Hills Ferry	1.70	1.41	2.03	1.55	.70	.27	.00	.00	.13	.35	1.78	1.89	11.81	19.20	7.54
San Mateo	4.00	2.95	2.64	2.19	.47	.24	T.	.00	.12	.92	1.92	2.95	18.40	27.49	7.34
Crystal Springs	7.77	6.54	7.14	4.07	1.36	.51	.03	.00	.29	1.95	3.19	5.29	38.14	55.59	17.15
Menlo Park	2.52	1.92	2.21	2.23	.45	.35	.02	T.	.05	.43	1.31	2.80	14.29	20.25	9.72
Woodside	5.71	2.74	4.78	4.55	.41	1.12	.00	.02	.16	1.27	5.90	9.47	36.13	37.40	21.59
Pigeon Point	2.39	1.93	2.12	3.31	1.01	.26	.01	.00	.18	.80	1.79	3.17	16.97	37.28	9.15
Año Nuevo Island	3.05	2.40	3.13	3.41	.94	.40	.09	.00	.25	1.06	2.32	5.19	22.24	31.91	9.88
San Andreas	9.06	8.15	6.73	3.81	1.31	.37	.01	.00	.28	1.88	4.11	10.34	46.05	70.32	21.95
Pilarcitos	1.02	8.77	7.86	4.03	1.79	.49	.03	T.	.39	2.01	6.09	12.35	54.83	81.79	23.07
Point Montara	3.87	2.41	3.80	3.37	1.02	.45	.01	.00	.29	1.10	3.29	4.79	24.40	33.57	8.62
Mount Hamilton	3.68	6.06	6.05	4.54	2.34	1.31	.00	.04	.25	3.03	1.87	4.57	33.74	55.09	23.31
Wrights	7.91	4.48	2.60	11.32	.00	.00	.00	.00	.00	1.32	8.45	4.74	40.82	-------	-------
San José	2.70	2.49	2.47	1.97	.41	.20	T.	.00	.10	.53	1.16	1.78	13.81	21.17	4.99
Santa Clara	2.05	1.70	2.97	1.50	.52	.39	.00	.01	.03	.59	1.62	2.55	13.93	20.37	10.42
Los Gatos	6.41	5.60	1.68	3.59	.15	T.	.02	.00	.03	.49	6.99	4.00	28.96	-------	-------
Tennant	2.99	3.63	4.01	3.03	.93	.21	.00	.03	.09	.62	.74	3.96	20.24	29.95	15.08
Gilroy	5.07	2.95	2.76	2.05	.40	.13	T.	.01	.20	.86	2.05	3.02	19.50	31.04	6.53
Livingston	1.72	1.22	1.13	2.13	.00	.00	.00	.00	.08	.08	.53	.46	7.35	-------	-------
Central Point	1.52	1.05	1.85	1.29	.48	.20	T.	T.	.08	.32	1.35	1.61	9.75	15.47	4.97
Merced	2.65	1.41	1.44	1.78	.54	.19	.01	.00	.10	.43	1.24	1.96	11.75	30.83	3.03
Athlone	1.62	1.81	1.50	2.40	.00	.12	.00	.00	.29	.16	.58	1.00	9.48	-------	-------
Los Banos	1.61	1.08	1.20	.77	.28	.13	.02	T.	.04	.21	1.46	.74	7.54	-------	-------
Aptos	3.81	3.27	1.76	3.50	.20	.00	.04	.00	.18	.58	3.15	5.57	22.06	-------	-------
Santa Cruz	6.18	3.98	3.18	3.03	.51	.34	.01	.01	.32	1.36	3.53	3.79	25.24	36.41	16.48
Watsonville	4.85	4.74	2.14	1.76	.59	.00	.00	.00	.10	1.17	1.75	7.43	24.53	-------	-------

RAINFALL FOR EACH MONTH IN THE YEAR, ETC.—Continued.

NAME OF STATION.	January	February	March	April	May	June	July	August	September	October	November	December	Yearly Average	Greatest Seasonal Precipitation	Least Yearly Precipitation
Soquel	T.	T.	T.	T.	T.	T.	.00	.00	.00	.00	T.	T.	T.	-------	-------
Buchanan	2.60	3.12	3.00	4.33	.09	.14	.00	.00	.89	.46	.81	3.33	18.77	22.77	8.70
Fort Miller	1.65	1.76	4.28	1.91	1.05	T.	T.	.00	.03	.28	2.63	5.40	19.00	45.68	8.88
Hamptonville	1.71	3.18	2.29	3.42	.70	.10	.00	.00	.00	2.23	1.09	4.24	18.96	-------	-------
Borden	1.47	1.40	1.26	1.41	.37	.16	.02	.00	.04	.32	1.14	1.26	8.85	18.27	2.57
Big Dry Creek	3.84	3.36	3.17	.45	.22	.11	.05	.00	.02	.67	1.47	3.23	16.59	21.58	4.78
Firebaugh Ferry	1.78	1.14	1.12	.94	.16	.17	T.	T.	.07	.31	1.51	1.28	8.48	18.84	2.24
Fresno	1.30	1.21	1.21	1.64	.30	.13	.00	.00	.12	.39	1.21	1.28	8.79	16.62	4.87
Kings River (Centerville)	2.42	3.00	2.97	2.77	.81	.31	.00	T.	.06	.92	.83	2.30	16.39	31.91	11.03
Kingsburg	.98	1.35	1.21	1.66	.39	.11	.00	.00	.08	.25	.86	1.56	8.45	15.85	2.20
New Idria	2.18	2.43	5.56	3.54	.76	.85	.01	.00	.08	.55	2.09	3.21	21.26	33.61	11.44
Hollister	2.42	1.83	1.67	1.25	.33	.19	.02	T.	.09	.55	1.32	1.49	11.16	18.12	4.69
Pajaro	4.13	2.91	2.65	1.85	.43	.20	.01	.01	.13	.90	1.80	2.88	17.90	28.01	5.53
Salinas	3.03	2.34	2.00	1.33	.33	.20	.01	.00	.10	.60	1.21	2.09	13.24	23.75	3.90
Monterey	2.13	2.18	3.03	1.81	.41	.22	.04	.01	.86	.57	1.44	2.52	14.42	21.45	9.16
Chualar	2.70	2.42	2.13	1.42	.36	.18	.01	.00	.03	.64	1.47	1.54	12.90	-------	-------
Soledad	2.03	1.68	1.58	.78	.24	.12	T.	.01	.02	.26	.88	1.06	8.66	16.36	2.65
Jolon	3.68	3.56	3.36	2.27	.67	.15	.00	.06	.10	.78	3.26	2.17	20.06	-------	-------
Gonzales	1.73	1.78	1.70	1.16	.30	.16	.00	.00	.03	.47	1.04	1.66	10.03	-------	-------
Kings City	.38	5.08	.18	.58	.02	.09	.00	.00	.06	.10	.34	.03	6.86	-------	-------
Kingsburgh	1.79	3.10	3.85	2.54	.89	.40	.00	.00	.13	.94	.04	.30	14.58	24.53	10.82
Visalia	1.25	1.55	1.15	1.62	.30	.02	T.	T.	.04	.44	1.02	1.86	9.25	13.10	3.95
Goshen	.97	1.40	1.10	1.39	.36	.01	.00	.00	.12	.31	.77	1.44	7.87	10.62	4.91
Hanford	1.71	1.62	1.81	1.72	.27	.24	.00	.01	.04	.45	1.62	2.10	11.59	-------	-------
Lemoore	1.49	1.13	1.09	1.50	.26	.20	.00	.00	.04	.25	1.12	1.41	8.49	15.25	1.07
Tulare	1.29	1.23	.93	1.18	.31	.10	.01	.00	.02	.16	.44	.97	6.64	11.65	3.07
Lewis Valley	1.46	1.90	1.23	2.16	1.00	.11	T.	.00	.03	.39	1.15	2.19	11.62	24.82	6.35
Bishop Creek	.09	.53	.48	.23	.14	.09	.00	.00	.10	.04	.02	.30	2.02	-------	-------
Camp Independence	1.22	.56	.52	.21	.27	.04	.10	.18	.07	.32	.21	2.27	5.97	7.06	1.63
Keeler	.25	.54	.24	.64	.41	.22	.17	.10	.27	.27	.18	.38	3.67	-------	-------
San Miguel	.52	5.96	.12	1.40	.24	.26	.00	.00	.58	.37	.49	.22	10.15	-------	-------
Paso Robles	.51	6.14	.34	1.10	.44	.00	.00	.00	.00	.21	.48	.69	9.91	-------	-------
San Luis Obispo	4.68	3.75	2.81	2.05	.35	.14	T.	T.	.03	.72	1.95	4.53	21.01	42.40	8.15
Port Harford	2.86	.48	1.21	1.84	.00	.00	.00	.00	.00	.00	13.62	4.12	24.13	-------	-------
Delano	.74	1.22	.85	1.17	.63	.02	.00	.00	.01	.17	.49	.92	6.22	11.52	1.41

Sumner	.83	.94	.67	1.09	.33	.10	T.	.00	.04	.08	.52	.78	5.38	9.10	1.41
Caliente	1.36	1.99	1.52	2.30	.81	.17	.01	.00	.02	.46	.80	1.49	10.93	18.15	3.16
Tehachapi	1.28	3.54	1.68	1.83	.38	.13	.01	.09	.03	.42	.73	1.52	11.64	18.77	4.75
Keene	1.62	2.96	1.99	2.26	.49	.22	.01	T.	.06	.68	.92	1.90	13.11	24.25	5.23
Mojave	.59	1.33	.40	.25	.01	T.	.06	.00	.03	.10	.37	.91	4.05	9.96	.00
Fort Tejon	1.29	1.69	1.84	2.37	.96	.21	.01	.16	2.02	1.00	1.02	4.32	16.89	32.97	11.97
McClung Ranch	1.02	.94	.66	1.05	.20	.02	.00	.00	.01	.14	.11	1.49	5.64	6.25	5.21
Camp Cady	.27	.50	.56	.25	.05	T.	.34	.65	.00	.05	.40	.15	3.22	-------	-------
Daggett	.48	1.44	1.17	1.10	.49	.00	.00	.00	.00	.00	.00	.29	3.97	-------	-------
Fenner	.15	1.30	1.25	.15	1.09	.05	.00	.00	.03	.00	.00	2.40	6.45	-------	-------
Needles	-------	1.86	2.08	.10	.75	.00	.00	.00	.06	.00	.00	1.32	6.17	-------	-------
San Bernardino	3.66	3.03	1.97	1.75	.44	.06	.02	.08	.05	.43	1.58	3.10	16.17	37.51	8.98
Lugonia	1.56	3.48	3.59	2.82	1.04	.48	.00	.00	.00	.21	.73	1.51	15.42	-------	-------
Ontario	2.15	6.07	2.71	2.50	.40	.42	.00	.00	.00	.12	.94	3.05	18.36	-------	-------
Colton	1.36	2.36	1.42	1.55	.57	.08	.00	.02	.00	.25	.50	1.20	9.31	23.35	5.43
Rancho de Jurupa	.95	1.51	3.12	.33	1.14	.00	.00	.09	.00	.00	1.67	4.77	13.58	-------	-------
Riverside	1.12	1.97	1.93	1.16	.43	.12	.00	.60	.02	.27	.37	1.38	9.37	22.54	2.94
San Gargonio	4.15	4.24	2.99	2.92	.93	.04	.08	.00	.05	.45	.72	1.48	18.05	-------	-------
Rings Station	4.65	4.69	3.44	2.82	.79	.19	.16	.04	.08	.53	1.70	3.33	22.42	35.74	12.00
Arroyo Grande	2.40	.77	1.05	1.78	.00	.00	.00	.00	.00	.00	12.38	4.13	22.51	-------	-------
Santa Maria	.98	3.46	.98	1.87	.00	.00	.00	.00	.00	.03	4.68	2.31	14.31	-------	-------
Guadaloupe	1.65	2.25	1.42	2.61	.00	.00	.05	.00	.00	.07	4.73	2.05	14.83	-------	-------
Los Alamos	1.48	.28	2.61	2.06	.23	.00	.00	.00	.00	.00	10.82	2.04	20.04	-------	-------
Point Concepcion	1.24	3.81	2.73	1.48	.11	.16	.00	.02	T.	.37	.44	1.87	12.23	32.54	2.30
Santa Barbara	3.87	3.88	1.90	1.61	.33	.12	.00	T.	.04	.46	1.49	3.59	17.29	34.47	4.19
Nordhoff	4.18	6.40	4.50	3.48	1.25	.48	.00	.00	.00	.42	4.89	2.24	27.84	-------	-------
San Buenaventura	3.86	3.57	2.37	1.48	.38	.27	.00	.00	.01	.44	1.96	2.53	16.87	-------	-------
Los Angeles	3.93	3.76	1.90	1.34	.35	.09	T.	.08	.01	.35	1.49	2.73	16.03	32.16	3.97
Ravenna	1.61	2.68	2.11	1.38	.09	.27	.02	.03	.10	.41	1.09	1.92	11.71	27.27	3.83
Newhall	2.09	3.55	2.27	1.82	.48	.16	T.	.00	T.	.26	1.45	2.64	14.72	42.11	3.04
San Fernando	2.31	3.79	2.27	2.00	.43	.00	.02	T.	.00	.36	1.47	2.64	15.29	18.91	7.87
Cahuenga Valley	2.69	5.08	2.95	2.18	.97	.20	.00	.04	.02	.45	2.36	2.51	19.45	30.43	9.00
Spadra	2.80	2.81	1.77	1.31	.32	.06	T.	.01	.01	.33	1.06	1.68	12.10	24.50	5.80
Santa Monica	2.18	3.32	.61	2.07	.36	.00	.00	.00	.08	.01	2.47	1.39	12.49	17.30	10.22
Downey	1.28	2.98	1.69	2.88	.04	.00	.00	.38	.00	.00	.72	.87	10.84	-------	-------
Drum Barracks	2.58	1.26	2.24	.37	.02	.00	.05	.24	.00	.00	.96	2.89	10.61	-------	-------
Orange	6.80	1.83	1.18	1.55	.33	.00	.00	.07	.00	.02	2.84	1.22	15.84	-------	-------
Anaheim Barracks	1.81	2.75	1.74	1.48	.54	.13	.00	T.	T.	.34	.93	1.90	12.12	26.17	4.35
Alosta	4.06	6.19	5.17	3.10	.78	.42	.00	.00	.00	1.01	1.75	2.97	25.45	60.62	12.09
Whitewater	.64	1.21	1.04	.48	.00	.00	.00	.03	.00	.13	.38	1.06	4.97	12.81	.84
Cabazon	.15	.12	.00	1.20	1.10	.00	.00	.00	.00	.00	.00	2.05	4.62	-------	-------
Indio	.34	.61	.12	.10	.05	.00	.00	T.	T.	.01	.24	.45	1.92	5.60	.10
Fall Brook	3.51	3.74	2.97	2.24	.53	.11	.02	.05	.05	.70	1.36	2.42	17.70	-------	-------
San Luis Rey	3.18	3.53	2.00	2.39	.09	.20	.00	.00	.01	.11	6.69	2.08	21.28	-------	-------
Escondido	3.27	3.23	2.54	1.84	.53	.22	.00	.02	.25	.48	1.39	1.92	15.69	32.05	7.70

RAINFALL FOR EACH MONTH IN THE YEAR, ETC.—Continued.

NAME OF STATION.	January	February	March	April	May	June	July	August	September	October	November	December	Yearly Average	Greatest Seasonal Precipitation	Least Yearly Precipitation
Julian	5.67	7.94	9.85	5.99	.73	.00	.00	.00	.00	.55	3.37	4.68	38.78	61.62	25.89
Mammoth Tank	.19	.43	.09	.11	.02	.00	.06	.13	.03	.14	.16	.49	1.85	3.11	.73
Poway	2.65	2.33	2.06	2.16	.54	.09	.01	.03	.08	.55	.94	2.51	13.95	29.45	8.48
Fort Yuma	.34	.40	.18	.10	.02	T.	.28	.67	.53	.15	.41	.32	3.40	7.04	.85
San Diego	1.55	2.22	1.38	.90	.44	.07	.01	.19	.03	.29	1.02	2.16	10.26	25.97	3.71
Campo	2.36	2.80	2.38	2.58	.27	.05	.60	.37	.01	.41	1.13	2.21	15.17	-------	-------
Otay Mesa	2.32	2.46	1.73	1.86	.69	.08	.10	2.15	.00	.36	1.45	1.30	14.50	-------	-------
Oakwood	4.78	2.18	2.52	.55	1.11	.00	.15	.00	.20	.23	.07	.08	11.87	-------	-------

WASHINGTON TERRITORY, OREGON, CALIFORNIA, NEVADA, UTAH, AND ARIZONA.

The following temperature and rainfall figures for January, 1888, by Mr. H. E. Wilkinson, Observer in the office of the officer in charge of the Pacific Coast Division, Signal Service Corps. Mr. Wilkinson has also given the lowest temperature ever recorded, along with the date, since observations began, and it will be observed, in most cases, that the polar wave which passed over the Pacific Coast during January, was colder than ever before recorded. The table is both interesting and instructive:

Stations.	Monthly Mean Temperature.	Highest Temp'ture and Date.	Lowest Temperature and Date.	Lowest Temperature Previously Recorded, and Date.	Rainfall.
Tatoosh Island, W. T.	36.4	55.4, 30th	14.0, 13th		12.10
Port Angelos, Wash. Ter.	31.7	54.2, 25th	06.3, 14th		5.43
Olympia, Wash. Ter.	32.5	56.0, 30th	—01.8, 15th	02.0 February, 1884	11.38
Fort Canby, Wash. Ter.	35.5	55.3, 31st	11.0, 15th	16.0 February, 1884	11.39
Spokane Falls, Wash. Ter.	15.5	51.7, 27th	—30.5, 16th	—27.7 January, 1883	3.96
Walla Walla, Wash. Ter.	21.1	65.4, 31st	—17.1, 16th		2.21
Portland, Oregon	30.0	62.0, 25th	—02.0, 15th	03.0 December, 1875	8.50
Roseburg, Oregon	35.1	71.1, 26th	—06.0, 16th	03.0 February, 1884	6.62
Ashland, Oregon	32.7	62.0, 26th	—03.0, 14th	12.0 February, 1887	3.81
Linkville, Oregon	20.1	45.6, 31st	—23.9, 15th	—04.0 February, 1884	2.77
Fort Klamath, Oregon	16.6	46.0, 26th	—39.0, 15th	—34.0 February, 1884	5.71
Lakeview, Oregon	21.9	50.0, 27th	—24.0, 15th		2.85
Eureka, California	44.6	76.9, 26th	20.3, 14th		12.95
Fort Bidwell, California	21.8	51.2, 30th	—25.5, 14th		3.28
Red Bluff, California	40.9	59.5, 30th	17.5, 14th	19.0 January, 1883	4.08
Sacramento, California	42.8	63.0, 25th	19.0, 14-15	19.0 January, 1854	4.81
San Francisco, California	46.3	62.8, 28th	28.7, 15th	33.1 February 5, 1887	6.81
Fresno, California	44.1	68.5, 26th	19.6, 16th		1.75
Keeler, California	35.3	58.0, 31st	11.8, 15th		0.70
Los Angeles, California	50.0	71.0, 26th	30.9, 10th	28.0 February, 1883	6.04
San Diego, California	51.6	64.5, 21st	35.0 8th	32.0 Dec., 1879, Jan., '80	1.96
Yuma, Arizona	51.6	78.6, 28th	20.7, 11th	22.5 January, 1883	0.18
Fort Apache, Arizona	34.6	64.7, 26th	06.7, 13th	—09.0 February, 1880	1.42
Prescott, Arizona	27.5	56.0, 28th	—12.0, 8th	—18.0 December, 1879	1.30
Winnemucca, Nevada	18.7	49.6, 25th	—28.0, 15th	—23.0 January, 1883	1.40
Carson, Nevada	27.6	57.8, 30th	—09.6, 16th		1.51
Salt Lake City, Utah	23.5	52.8, 30th	—16.7, 15th	—20.0 January, 1883	1.52
Helena, Montana	5.3	56.5, 30th	—41.0, 15th	—40.0 December, 1880	0.79
Boise City, Idaho	17.7	61.2, 28th	—27.8, 16th	—27.0 January, 1883	1.54

EFFECT OF TREES AND VEGETATION ON CLIMATES.

The following on climates, and how they are affected by trees and vegetation, is from the Encyclopedia Britannica, volume six, ninth edition, in which it says:

When the ground is covered with vegetation the whole of the sun's heat falls on the vegetable covering, and as none of it falls directly on the soil, its temperature does not rise so high as that of land with no vegetable covering. The temperature of plants exposed to the sun does not rise so high as that of soil, because a portion of the sun's heat is lost in evaporation, and the heat cannot accumulate on the surface of the leaves as it does on the soil. Hence, the essential difference between the climates of two countries, the one well covered with vegetation, the other not, lies in this, that the heat of the day is more equally distributed over the twenty-four hours in the former case, and, therefore, less intense during the warmest part of the day.

But the effect of vegetation on the distribution of the temperature during the day is most markedly shown in the case of *forests*. Trees, like other bodies, are heated and cooled by radiation, but owing to their slow conducting power the times of the daily maximum and minimum temperature do not occur till some hours after the same phases of the temperature of the air. Again, the effects of radiation are in the case of the trees not chiefly confined to a surface stratum of air a very few feet in thickness, but, as already remarked, are to a very large extent, diffused through a stratum of air, equaling, in thickness at least, the height of the trees. Hence, the conserving influence of forests on climate, making the nights warmer and the days cooler, imparting, in short, to the climates of districts clad with trees, something of the character of insular climates. Evaporation proceeds slowly from the damp soil usually found beneath trees, since it is more or less screened from the sun. Since, however, the air under the trees is little agitated or put in circulation by the wind, the vapor arising from the soil is mostly left to accumulate among the trees, and hence it is probable that forests diminish the evaporation, but increase the humidity, of climates within their influence. The humidity of forests is further increased by the circumstance that when rain falls, less of it passes immediately along the surface into streams and rivers; a considerable portion is at once taken up by the leaves of the trees, and percolates the soil, owing to its greater friability in woods, to the roots of the trees, whence it is drawn up to the leaves and there evaporated, thus adding to the humidity of the atmosphere.

Much has been done by Dr. Marsh and others in elucidation of the influence on climate of forests and the denudation of trees, in so far as that can be done by the varying depths of lakes and rivers, and other non-instrumental observations. Little, comparatively, has been done anywhere in the examination of the great practical question of the influence of forests on climate, by means of carefully devised and conducted observations made with thermometers, the evaporating dish, or the rain gauge. The most extensive inquiry on the subject yet set on foot has been for some years conducted in the forests of Bavaria, under the direction of Professor Ebermeyer, and a like inquiry was begun in Germany in 1875—the more important results being, that during the day, particularly in the warm

months, the temperature in the forests is considerably lower than outside in the open country, there being at the same time a slow but steady outflow of air from the forest; and that during the night the temperature in the forests is higher, while there is an inflow of air from the open country into the forest. The mean annual temperature in the forest increases from the surface of the ground to the tops of the trees (where it is observed to approximate to what is observed in the open country); a result evidently due to the facility of descent to the surface of the cold air produced by terrestrial radiation, and to the obstruction offered by the trees to the solar influence at the surface.

The mean annual temperature of the woodland soil from the surface to a depth of four feet is from 2 degrees to 3 degrees lower than that of the open country.

A series of observations was begun at Cornwath, Lanarkshire, in 1873, at two stations, one outside the wood and the other inside the wood, in a small grass plot of about fifty feet in diameter, clear of trees. From these valuable results have been obtained relative to the differences in the daily march of temperature, and the different rates of humidity, the most important being the substantial agreement of the mean annual temperature of the two places. The establishment of a station, with underground thermometers, which it is proposed to erect under the shade of the trees close to the station in the cleared space, will furnish data, which will not only throw new light on the questions raised in this inquiry, but also on the movements and viscosity of the air, and solar and terrestrial radiation.

FORESTS AND LAKES A PROTECTION AGAINST FROSTS AND CHANGEABLE WEATHER, AND OTHER IMPORTANT CLIMATIC MEMORANDA.

Why forests and lakes protect the countries in which they are situated from the extremes of heat and cold, and why the Swiss build their houses on the sides of the hills and mountains instead of in the valleys, and also shows the variability in the change of temperature caused by elevation. This information is culled from the ninth edition of the "Encyclopedia Britannica," and is as follows:

Observations show that the rate at which the temperature falls with the height is a very variable quantity—varying with latitude, situation, the state of the air as regards moisture or dryness, and calm or windy weather, and particularly with the hour of the day and the season of the year. In reducing temperature observations for height, 1° for every three hundred feet is generally adopted. In the present state of our knowledge this or any other estimation is at best no more than a rough approximation, since the law of decrease through its variations requires yet to be stated, being in truth one of the most intricate and difficult problems of climatology awaiting investigation at the hands of meteorologists.

Among the most important climatic results to be determined in working out this problem are the heights at which in different seasons the critical mean temperatures, which have important relations to animal and vegetable life, are met with in ascending from low lying plains in different regions of the world. * * * Under this head by far the most important class of conditions are those which result in extraordinary modifications,

amounting frequently to subversions of the law of the decrease of temperature with the height. This will perhaps be best explained by supposing an extent of country diversified by plains, valleys, hills, and table lands to be under atmospheric conditions favorable to rapid cooling by nocturnal radiation. Each part being under the same meteorological conditions, it is evident that terrestrial radiation will proceed over all at the same rate, but the effects of radiation will be felt in different degrees and intensities in different places. As the air is in contact with the declivities of hills and rising grounds, becomes cooled by contact with the cooled surface, it acquires greater density, and consequently flows down the slopes and accumulates on the low lying grounds at their base. It follows, therefore, that places on rising ground are never exposed to the full intensity of frosts at night; and the higher they are situated relative to the immediately surrounding districts the less are they exposed, since their relative elevation provides a ready escape downwards for the cold air almost as speedily as it is produced. On the other hand, valleys surrounded by hills and high grounds not only retain their own cold of radiation, but also serve as reservoirs for the cold heavy air which pours down upon them from neighboring heights. Hence mist is frequently formed in low situations, whilst adjoining eminences are clear. Along low lying situations in the valleys of the Tweed and other rivers of Great Britain laurels, araucarias, and other trees and shrubs were destroyed during the great frost of Christmas, 1860, whereas the same species growing on relatively higher grounds escaped, thus showing by incontestible proof the great and rapid increase of temperature with height at places rising above the lower parts of the valleys.

This highly interesting subject has been admirably elucidated by the numerous meteorological stations of Switzerland. It is there observed in calm weather in winter, when the ground becomes colder than the air above it, that systems of descending currents of air set in over the whole face of the country. The direction and force of these descending currents follow the irregularities of the surface, and, like currents of water, they tend to converge and unite in the valleys and gorges, down which they flow like rivers in their beds. Since the place of these air-currents must be taken by others, it follows that on such occasions the temperature of the tops of mountains and high grounds is relatively high, because the counter currents come from a great height, and are therefore warmer. Swiss villages are generally built on eminences rising out of the sides of the mountains with ravines on both sides. They are thus admirably protected from the extremes of cold in winter, because the descending cold air-currents are diverted aside into the ravines, and the counter currents are constantly supplying warmer air from the higher regions of the atmosphere.

Though the space filled by the down flowing current of cold air in the bottom of a valley is of greater extent than the bed of a river, it is yet only a difference of degree, the space being in all cases limited and well defined, so that in rising above it in ascending the slope the increased warmth is readily felt, and, as we have seen, in extreme frosts the destruction to trees and shrubs is seen rapidly to diminish.

The gradual narrowing of a valley tends to a more rapid lowering of the temperature, for the obvious reason that the valley thereby resembles a basin almost closed, being thus a receptacle for the cold air-currents which descend from all sides. The bitterly cold furious gusts of wind which are often encountered in mountainous regions during night are simply the outrush of cold air from such basins.

Two chief causes which tend to counteract these effects of terrestrial radiation are forests and sheets of water. * * * Deep lakes may be

regarded as sources of heat during winter, and places situated near their outlet are little exposed to cold gusts of wind, while places on their shores are free from the severe frosts which are peculiar to other low lying situations. The frosts of winter are most severely felt in those localities where the slopes above them are destitute of vegetation, and consists only of bare rock and soil, or of snow. If, however, the slopes be covered with trees, the temperature is warmer at the base and up the sides of the mountain, the beneficial influences of forests consisting in the obstacles they offer to the descending currents of cold air, and in distributing the cold produced by terrestrial radiation through a stratum of the atmosphere equaling in thickness the height of the trees. Hence as regards strictly local climates, the intelligent knowledge of which is of great practical value, it follows that the best security against the severity of cold in winter is afforded where the dwellings are situated on a gentle acclivity a little above the plain or valley from which it rises with an exposure to the south, and where the ground above is planted with trees. * * * Extensive forests tend to mitigate the extremes of temperature and distribute its daily changes more equably over the twenty-four hours.

ITALIAN CLIMATE.

The following article was taken from the work of Dr. J. Henry Bennett, entitled "Winter and Spring on the Shores of the Mediterranean, or the Riviera of Italy." The description is of the climate of Mentone, as that is a good sample in general of the great Riviera of Northern Italy. It will be found in many particulars to resemble the various climates of California, and as a health resort resembles very much the winter climate of Santa Barbara, with the balance in favor of our own State:

The characteristics of the Mentone winter climate are: Absence of frost, prevalence of northerly winds, moderate dryness of the atmosphere, complete absence of fog, paucity of rainy days, clearness and blueness of sky, general heat and brilliancy of the sun, cool night temperature, and a bracing coolness of the atmosphere generally.

Careful observation, during ten winters, of the meteorological conditions which reign on the Genoese Riviera, and at Mentone, has gradually enlarged my experience, and led me to form a clear idea of their nature and of their influence over the climate.

As we have seen, the Mentonian district, which has been the principal seat of my observation and study, is a small amphitheater, situated on the coast line or undercliff of the mountains of Southern Europe, as they reach the Mediterranean. To the northeast, north, and northwest, are the highest mountain chains of Europe, extending hundreds of miles.

Further still to the northeast lies the table land of Europe, which reaches to the Arctic regions. As a necessary result of this geographical position, the northern winds—especially the north and northeast, must be very dry winds.

Firstly, they have been dried by traveling over a great continent.

Secondly, they have had nearly all the remaining moisture wrung out of them by the extreme cold of the high regions, which they have to pass over when crossing Alpine chains, before they reach the Mediterranean. The physical evidences of the extreme dryness of the atmosphere, when

northerly winds reign, are manifold. Firstly, with a north and northeast wind, there is generally a difference of from 9° to 12° Fahrenheit, between the wet and dry-bulb thermometers.

With the northwest, which crosses lower mountain chains, and may come from the North Atlantic, the difference is generally from 5° to 8° or 9°.

Secondly, the atmosphere is generally clear; the sky blue; the sun shines warmly; the nights are comparatively cold, and the summits of mountains above four thousand feet high, are generally free from clouds.

These phenomena are easily explained on meteorological grounds. The presence of moisture in the air, either as imperceptible vapor or as cloud, gives a white appearance to the sky, and veils the earth from the sun's rays. It thus becomes a kind of shield, a protection from the warmth of the sun.

When moisture scarcely exists, and the air is dry, as it is in the Mediterranean with a north wind, in Egypt, in the desert of Sahara with south winds, indeed, in all dry regions, the sky is always blue, the sun shines with great power, and at night, owing to rapid radiation of the earth's heat into space, the air becomes comparatively cold.

Such is the climate of the north Mediterranean coast with northerly winds. The sky is clear and blue, the sun shines like a globe of fire, which it really is, and its rays reach the earth with great power. The nights are there clear, the stars shine with a brightness unknown in the north, and the temperature of the air is cold compared with what it is in the daytime. * * * The English climate is partly explained by the above facts. The atmosphere above the British Isles is always loaded with aqueous vapor, which gives to the sky its usual whitish color. The aqueous vapor of the atmosphere shields the earth from the action of the sun's rays during the day, and prevents radiation during night.

Hence the coolness of our summer, as compared with that of the same continental latitudes, where this aqueous shield is wanting. In winter, when the sun is low on the horizon and its rays are feeble, the cloud atmosphere, by promoting radiation, keeps in the heat previously acquired, and contributes, with the gulf stream, to render the British winter milder than that of the drier continental regions in the same parallel of latitude. The influence of these meteorological conditions on climate has been well explained of late by Professor Tyndall in his lectures on heat. It is also beautifully illustrated by the meteorological observations of Mr. Glaisher during his aeronautic ascensions. Once above the aqueous vapor and the clouds, which extend several thousand feet high in our climate, a dry atmospheric region is reached, where the sky appears intensely blue. The sun's rays here have so much power that they scorch and blister the face and hands, although the thermometer may be much below the freezing point. The Mediterranean climate, when the north winds blow, is like this upper region of our own atmosphere. The air, containing but little moisture when these north winds reign, as they do during the greater part of the winter, the sky is blue, and the sun shines through it fiercely, even in midwinter. It thus warms all the objects with which it comes in contact, and which are sheltered from the wind, that is the entire under cliff.

The northwest wind, called the mistral in this part of the Mediterranean, usually blows from the south of France as a cold, dry, cutting wind, which is much dreaded. One of the great climatic advantages of Mentone is its complete protection from this wind by the Turbia Mountain, which separates it from Nice.

When the mistral blows, the sky remains blue and the sun shines warmly. Sometimes, however, the northwest wind blows no longer as a

local wind originating in the south of France, but as a grand northwest European wind coming from the north seas and northwest Atlantic. Then it brings black clouds loaded with rain which may fall in the district or out at sea, and the wet bulb thermometer rises. When rain does fall, with a northwest wind, there is generally a grand oceanic and European northwesterly storm; but such rain is rare. It is still more so with the strictly continental winds, or the north northeast and east winds. Indeed, when rain falls at Mentone, with any such winds, it is generally at the end of a European gale from these regions, of which the newspapers bring us the details a few days later. Such rain becomes snow on the higher elevations of the mountains that surround and inclose the district.

Even with a direct southeast wind, snow may fall, exceptionally, at Mentone, inside the amphitheater, owing to its being open to the southeast in a line with the high mountains of Corsica, which lie direct southeast and are thus covered with snow. Snow, with a southeasterly wind, generally falls in the latter part of the winter, in March for instance, when immense masses of snow have accumulated on the Corsican mountains. Before this accumulation has taken place, in early winter, the southeast wind is a warm wind, the sirocco. Thus during the winter there is very little rain from the northern quarters; and as, during the winter months, from November to May, the wind is generally from these quarters, the dry, clear, sunny, but cool winter climate of Mentone is explained. The exceptional winter warmth, for the latitude, depends on mountain protection and on other causes.

When rain falls, with the wind in the northern quarters, it is generally gentle, moderate in quantity, and does not present the tropical character. When the northerly winds bring clouds and scud over the mountains, and the atmosphere in the Mentonian amphitheater and out at sea is warm, these clouds often melt gradually and disappear. It is a very interesting sight to see thick banks of clouds thus rising over the summits of the higher mountains in the background, expanding on the sky above, and then melting away as they advance southwards into warmer atmospheric strata. After a time, however, if the wind which impels them is powerful, they cool the air, accumulate, and the entire sky becomes overcast.

With southwesterly and southeasterly winds, the fall of rain at Mentone, and on the Riviera in general, is often very great in a limited space of time; indeed, quite tropical. This is also sometimes the case when northerly winds meet southerly currents on or near the coast line, and condense their moisture. The rainfall may amount to five or six inches in the twenty-four hours.

Whenever this occurs, the watercourses are filled, from bank to bank, with enormous volumes of water, which carry down great masses of stone, like straws, from the mountains, and excavate wide beds as they approach the shore line. These watercourses are at other times, as in central and southern Italy, mere rivers of stones with a thin stream of water trickling through the middle.

On one night—December, 1859—four and a half inches fell in ten hours. The greatest amount of rain that was known to have fallen in twenty-four hours at Greenwich in five years was 2.63 inches.

The total rainfall during my first winter's residence at Mentone, 1859–60, was 23.68 inches, from October ninth to April twenty-first, viz.: October, 8.02 inches; November, 2.21; December, 6.96; January, 3.24; February, .18; March, 1.26; and April, 1.81 inches. These data were given me by a friend who kept an accurate register. According to my own observations, it rained in that winter, in November, 5 days; in December, 5; in Janu-

ary, 4; in February, 1; in March, 6; in April, up to the twenty-third—8 days; in all, 29 days, from November third until April twenty-third. In October it rained nearly every day.

It very often rains on the mountains, or a few miles out at sea, when it is quite clear and fine on and near the seashore. In the former case, the wind is generally a southern wind, and, as it ascends the mountain, it evidently meets with colder strata of air which precipitate its moisture, forming rain clouds. I have repeatedly sat on the mountain side and watched a current of warm air rise from the sea, at a distance, form at first a vapor on the shore, and then a white cloud, gradually ascending the mountain. It is singular to see the small cloud thus spring, as it were, from the waves near the coast line, gradually expanding and enlarging as it creeps up the mountain side.

The rain, in these instances, is often confined to the upper mountains, and increases the volume of torrents and rivulets, although it may remain quite fine at and around Mentone, as also on the sea horizon. When, on the contrary, it rains a few miles out at sea, whilst there is fine, dry weather at Mentone, the wind generally comes from the contrary direction—from the north. The cold north wind, passing overhead, impinges upon the sea some distance from the shore, meeting warmer atmospheric strata. Dark banks of clouds thus form on the horizon and rain falls several miles from the coast. In either case the coast ledge may, and often does, enjoy a happy immunity.

The average fall of rain at Nice is 25 inches. I presume that the annual fall at Mentone is greater, from its being surrounded by mountains on all sides but the south, the southeast, and southwest.

The average number of rainy days at Nice is 60. M. de Brea, a native and resident of Mentone, and a gentleman of high scientific attainments, has published a meteorological table, founded on ten years' observation, from 1851 to 1861. According to his experience, the average number of days or nights during which it rained little or much at Mentone is 80, or 20 more than at Nice. We may presume, therefore, that the fall of rain is greater, although the consequence is not necessary. At Greenwich the average rainfall is only 25 inches, yet the number of rainy days is 155. At Torquay the average number of rainy days is also 155. At Pau the average rainfall is 43 inches; rainy days, 119. At Malaga the number of rainy days is only 40. At Madeira the rainfall is variable; the average about 30 inches; the rainy days, 88.

The amount of rain that falls does not so much characterize the climate of a locality as the manner in which it falls. At Mentone, as at Nice and along the entire Riviera, thoroughly cloudy days and days of incessant rain are rare. They do, however, occur occasionally in the winter, and principally with continued southerly winds. The sky is then quite obscured, so that the sun is not seen as in the north, and rain may fall for several days and nights. But this does not usually take place more than two or three times in the course of the winter. Many inches of rain fall on these occasions, thoroughly soaking the ground. After two or three days the clouds disperse, the sun peers forth, and again courses through a clear blue sky like a blazing fire. In a few hours the ground becomes dry, and many days of uninterrupted sunshine generally follow, during which outdoor life goes on as during a fair rainless September in England.

There are two rainy seasons on the Riviera—one, the autumnal equinox at the latter end of September and during October; the other, the vernal equinox in March, ending with the first week in April. The autumnal rainy season is rather irregular in its periodicity. It usually occurs under

the influence of southwesterly gales, and extends, more or less, into November. The rains do not last in most winters more than three or four weeks, and that not continuously. The rest of the winter, until the spring, is generally dry and fine, under the influence of the northerly winds, with the exception of a few occasional days of rain, when the wind turns to southern quarters. Heavy rain again falls in the latter half of March, with southwesterly or southeasterly gales and storms, as in northern Europe. These rains saturate the earth and renew the springs.

Under their fostering influence, and with the help of the ardent sun, which shines through the clear dry atmosphere, vegetation then advances with astonishing rapidity. As in England, and in most other regions, the seasons, and more especially the winter, vary in different years, so that it is difficult to form a correct opinion from the experience of any one year. There are winters during which southwesterly winds prevail, often clouding the sky and bringing rain at intervals throughout the winter. Such were the winters of 1864–65, and of 1868–9.

During the summer but little or no rain falls. In some years the drought lasts, without cessation, for six or seven months, from April or May to October or November. Thence the absolute necessity of tanks for the irrigation of the lemon and orange trees, which, as we have stated, cannot thrive and bear fruit without irrigation during the dry season. The exceptional dryness of the summer along the Riviera, in the south of France, in Spain, and in the Mediterranean generally, is explained by the fact that this great inland sea lies on the northern limit of that part of the earth's surface to which, in physical geography, is given the name of the rainless tract. The highest expression of this region is the desert of Sahara, which continues those of Arabia and Central Asia. The principal cause of their existence is, no doubt, the passage of northeasterly winds over Asia and southern Europe during the entire year, either as upper or surface currents. These winds passing over continents and great chains of mountains, gradually lose their moisture, until they have but little to bestow on the regions they attain in the more advanced stage of their progress, and the latter consequently become dry regions or deserts for want of rain. The winds that course over the earth's surface may be divided into two principal currents.

The one, from the poles to the equator; the other, a return current from the equator to the poles.

Owing to the earth's diurnal motion of rotation, the wind from the poles to the equator takes a slanting easterly direction; that from the equator to the poles a westerly one. Thus, in the northern hemisphere the wind from the pole to the equator is a northeast wind; that from the equator to the pole a southwesterly one. From the tropic of Cancer, or from about latitude 30° to the equatorial region, the northeast wind is always a surface wind, and constitutes the northeast trade. From the pole to the tropic the systemic northeast wind is either an upper current or a surface one, according to seasons and other influences.

According to M. de Brea's statistics, omitting the fractions, the annual number of fine days in which the sun shines without clouds is 214; the number of days in which the sun shines with clouds is 45; and the number of days in which the sun is not seen, the sky being completely obscured, without rain, is 24; to which we may add: days of rain, 80, many in part sunshiny.

The rainy days principally occur between the months of October and May. In summer, as has been stated, there is sometimes not a drop of rain for months together. The winds can then blow from the south with-

out their vapor being condensed into clouds and rain on the mountain summits which skirt the coast. The mountains are themselves heated with the powerful rays of the summer sun, and the sea-borne winds meet currents still warmer than themselves. Even in winter, a very gentle south wind from the sea, may not bring cloud and rain. All its superabundant moisture may be at once taken up, owing to the great dryness of the colder mountain atmosphere. Notwithstanding the mildness and sunny brightness of the weather, yet it is still decidedly winter at Mentone from December to April. The nights are chilly during four months—from December to April—the thermometer generally falling to between 46° and 54° with south winds, and with north winds to between 40° and 45°, sometimes below 40°. In the daytime it is generally cool in the shade, and out of the shade when the sun is obscured by clouds. The ordinary "shade maximum" varies from 50° to 56° when the sun shines, and is lower still when it does not. The temperature always falls as soon as the sun disappears or sets, and often at once reaches the minimum of the twenty-four hours, owing, no doubt, to a cool down draught from the mountains. The heat is evidently produced by the direct influence of the sun. In a south room, whenever the sun is on the room, the window can be left wide open; and, without a fire, the thermometer will generally remain at about 64°. But as soon as the sun disappears, the window has to be shut, and chilly persons require a wood fire.

In midday, the north rooms on the same floor are, even when the sun shines, four, six, or eight degrees colder than the south. Even before sunset, as soon as the sun disappears behind the mountains, there is a difference of six or eight degrees in the temperature of the atmosphere if northerly winds prevail. When the sun is permanently obscured by clouds, the air often feels chilly, even with a south wind, and the complaints against the climate are loud and numerous.

The climate of the Mentone amphitheater and of the Riviera in general is a favorable specimen of what botanists call the warmer temperate zone. Plants live nearly everywhere that frost kills at other places. Many annuals in a colder region become perennials here, and many forms of vegetation new to the more northern flora make their appearance. It is the Mediterranean climate, but that of the more favored Mediterranean regions. In Italy, for instance, the most protected southern parts must be reached to find the same immunity from frosts. On the southern shores of the Mediterranean, in Algeria, there is the same immunity from frost; but owing to the presence of the Atlas Mountains, cool rains predominate throughout the winter, with the north winds which usually rule at that time of the year. Mentone also is warmer and more protected from northern winds than its neighbor, Nice; more so than Cannes, although the general features of the climate must be the same, for all are only a short distance apart. It is the question of fruit walls in the same orchard—one higher and giving more protection than the others, but all turned towards the south. At Nice there are sheltered situations, such as the Cimiez, the Carabacel, and Villafranche, in which the protection is greater than in the town itself, and which thus assimilates to Mentone without, however, equaling it.

Foreign Temperature, by Sir James Clark, with Palermo, Algiers, and Mentone added to the table by Dr. Henry Bennett, from whose work, "Winter and Spring on the Shores of the Mediterranean," the following table was taken:

Names of Places.	Mean Temperature of Months.												Mean Temperature of Seasons.				Mean Annual Temperature.
	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Winter.	Spring.	Summer.	Autumn.	
Cairo	58.1	56.1	64.6	77.9	78.3	83.7	85.8	85.8	79.2	72.3	63.0	61.3	58.5	73.6	85.1	71.5	72.2
Santa Cruz (Canaries)	63.8	64.3	67.2	67.3	72.1	73.9	77.3	78.9	77.4	74.7	70.4	65.8	64.6	68.9	76.7	74.2	70.9
Ceylon (Hill District)	69.2	66.5	70.8	72.7	71.4	69.4	69.8	68.9	70.8	70.9	70.6	69.7	69.3	70.8	69.5	71.3	70.2
Malta	56.5	56.3	58.1	61.8	67.4	73.8	79.6	81.2	77.8	71.1	64.2	59.6	57.5	62.8	78.2	71.0	67.3
Corfu	52.6	51.8	54.6	58.3	66.7	72.3	77.7	81.3	78.3	70.8	63.8	58.4	54.3	59.8	77.1	71.0	65.6
Madeira	59.7	60.3	61.9	62.0	63.4	66.9	70.0	71.9	71.3	66.8	64.0	61.4	60.6	62.4	69.6	67.3	65.0
Palermo	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	53.1	59.3	74.7	66.8	64.4
Algiers	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	55.0	66.0	77.0	60.0	64.0
Port Jackson (N. S. W.)	61.7	71.6	69.6	64.0	59.7	54.9	53.9	55.3	59.3	63.5	67.7	69.2	54.6	63.4	70.9	64.0	62.9
Cadiz	51.4	53.7	55.2	59.6	63.8	68.2	70.3	72.9	70.2	67.1	58.8	53.6	52.9	59.5	70.4	65.4	62.9
St. Michael's (Azores)	59.0	59.0	59.5	61.0	63.0	67.0	68.0	70.0	68.0	63.0	56.0	55.6	57.8	61.2	68.3	62.3	62.4
Naples	46.5	48.5	52.0	57.0	66.5	71.0	75.0	76.5	72.5	65.0	54.5	50.5	48.5	58.5	70.8	64.5	61.4
Mentone	48.2	48.5	52.0	57.2	63.0	70.0	75.0	75.0	69.0	64.0	54.0	49.0	49.5	60.0	73.0	55.6	60.8
*San Remo	47.2	50.2	52.0	57.0	62.9	69.2	74.3	73.8	70.6	61.8	53.3	49.3	48.9	57.3	72.4	61.9	60.2
Rome	47.6	49.4	52.0	56.4	64.5	69.2	73.3	74.9	69.5	63.6	58.8	49.6	48.9	57.6	72.2	64.0	60.7
Pisa	44.0	48.1	51.5	56.3	63.8	70.6	77.5	77.5	73.5	62.6	52.3	47.0	46.0	57.2	75.2	62.8	60.6
Genoa	41.6	47.5	51.1	60.3	64.4	73.5	75.1	76.5	73.2	64.7	51.0	45.6	44.6	58.6	75.0	62.9	60.4
Toulon	40.0	44.0	48.0	55.0	68.0	70.0	74.0	79.0	64.0	62.0	51.0	46.0	43.3	53.7	74.3	59.0	59.9
Marseilles	54.8	45.1	49.1	-----	-----	-----	-----	-----	-----	58.2	50.4	46.6	45.5	57.6	72.5	60.1	59.5
Nice	45.8	49.0	51.4	57.0	63.0	69.0	73.6	74.3	69.4	61.8	53.7	48.6	47.8	56.2	72.3	61.6	59.5
Florence	41.0	45.0	48.0	56.0	64.0	69.0	77.0	76.0	70.0	59.0	53.0	47.0	44.3	56.0	74.0	60.7	59.0
Port Philip (N. S. W.)	67.6	68.9	65.7	58.6	55.6	50.9	49.2	50.1	54.5	58.2	62.5	65.9	50.1	58.4	67.5	60.0	59.0
Auckland (N. Z.)	67.9	67.3	64.2	60.5	54.7	51.4	49.0	51.7	54.0	56.4	60.1	63.9	50.7	56.8	66.4	59.8	58.4
Avignon	42.0	43.5	50.5	55.0	66.0	72.0	76.0	76.0	67.0	60.0	50.0	43.3	42.6	57.1	74.7	59.0	58.2
Montpelier	42.0	45.0	47.0	53.0	60.0	67.0	72.0	75.0	71.0	61.0	52.0	46.0	44.2	53.3	71.3	61.3	57.6
Pau	41.2	43.6	48.8	51.8	61.6	68.2	70.6	73.4	67.4	58.2	46.6	42.8	41.8	54.1	70.7	57.4	56.2
Sienna	39.7	40.2	46.2	53.7	62.4	67.5	72.8	72.3	66.0	58.3	47.1	41.7	40.5	54.1	70.8	57.1	55.6
Baths of Lucca	-----	-----	-----	53.0	60.5	63.0	70.0	71.5	66.0	-----	-----	-----	-----	-----	68.2	-----	55.0
Paris	35.6	40.5	43.5	49.6	58.1	62.5	65.7	65.2	60.4	52.4	44.2	39.2	38.4	50.4	64.5	52.3	51.5
*Cannes	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	49.6	51.4	73.0	61.0	59.9
*Valencia	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	50.7	63.0	75.3	66.0	63.8
*Gibraltar	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	58.0	66.0	77.0	67.0	64.0
*Lisbon	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	54.0	59.0	68.0	59.0	61.0
*Mexico	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	53.6	63.4	65.2	60.1	60.6
*Jerusalem	49.4	54.4	55.7	61.4	73.8	75.2	79.1	79.3	77.0	74.2	63.8	54.5	52.8	63.6	77.9	71.7	66.5

*Added to the table by Sergeant Barwick.

REVOLVING STORMS.

The following article on revolving storms, etc., was published in the San Francisco Daily "Call," April 2, 1889, the article being furnished that paper by Lieutenant H. P. McIntosh, of the Hydrographic Office, in the Merchants' Exchange, San Francisco, with a few notes added by the Lieutenant. The article is intensely interesting, and well worthy of careful perusal and close study:

REVOLVING STORMS—HOW DO THEY OCCUR, AND WHAT GOVERNS THEIR MOVEMENTS—PECULIARITIES OF SAMOA—ILLUSTRATION OF HOW THE WIND REVOLVES TOWARD THE CENTER OF LOW BAROMETER.—The recent meteorological phenomenon at Samoa has opened a field of inquiry with reference to hurricanes, tornadoes, typhoons, or by whatever name they may be classified, that will probably result in a more careful study of the causes, tracks, and influences than ever before. All information at this time is obscure, and, in a great degree, speculative. It has been established, however, that all are in a greater or less degree cyclonic, and that while they may be moving ahead at the rate of from eighteen to twenty miles an hour, the current within the air whirlpool is of terrific force. The nearer the center of the vortex, the greater the velocity.

AVERAGE VELOCITY.

The average velocity of the cyclone varies greatly, not only in different parts of the world, but in the same localities, and at the same season of the year. The size of a cyclone does not afford any rule whereby to estimate its rate of traveling, as both large and small ones are known to move with great rapidity, or at moderate or slow rates, without, apparently, any sort of law. It has been conjectured that the vortex below was carried forward by currents of wind above; but it is objected to this that the upper strata of clouds are often seen, through breaks in a storm, to move across or against the track of the cyclone, which itself has a track against the prevailing winds, as in the Atlantic hurricanes, moving to the east against the trade winds, the track of one having been observed for a distance of three thousand miles; or oblique to them, as the hurricanes of the Southern Indian Ocean, moving to the westsouthwest across the southeast trade.

These facts leave observers completely in the dark as to what causes their progressive motion, and also as to what causes their violent gyrations. This state of feeling is intensified by the fact that, like sandstorms or dust whirlpools, they will sometimes remain stationary for hours, and even for a day or more, moving at a rate of one fifth to two miles an hour, and then start off on a track upon which their size and velocity gradually increase. Usually they diminish in velocity in passing over land, and particularly if it is high land.

According to Redfield the West Indian and North American cyclones range from nine and five tenths miles an hour to forty-three miles. This would make a mean rate of about twenty-six miles. In the Southern Indian Ocean Thom estimates the rate of traveling to be from nine and ten minutes to a little more than two miles an hour. Colonel Reid, in his chart of the cyclone of 1809, lays down from seven to twelve and one half

miles per day. Piddington says that cyclones are of slow progression, being from two and three fourths to one and one fourth miles per hour on a singularly calm track. In the Mozambique Channel, Boyne, in his cyclone of 1838, lays down ten miles an hour. In the Arabian Seas the rate of progression is placed at from four to sixteen miles an hour. In the Bay of Bengal, Piddington estimates the progress at from a little over two to thirty-nine miles an hour, although from three to fifteen may be taken as the usual rates. The cyclone which traveled at the low rate of but little over two miles an hour (fifty-three miles in twenty-four hours) was the tremendous one which inundated Burisal and Backergunge, at the mouth of the Burrampooter and the Ganges, in which over fifty thousand persons lost their lives, and a vast amount of property in houses, cattle, and other things was lost.

In the Andaman Sea, the usual rate of a cyclone is four miles an hour. Off the coast of Ceylon they average from five to ten miles an hour, or more. In the China Sea, the rate of progression has been estimated at from seven to twenty-four miles an hour. The cyclone referred to came under the head of "stationary cyclones," and their periodicity and favorable opportunities of making observations enable the statistician to give approximately accurate data with regard to the peculiarities of the meteors. So far, unfortunately, the means of observation in the Pacific have been less favorable, and comparatively speaking but little is known of the habitat of the cyclone. There is no doubt, however, of the frequency of the occurrence between the Samoan group and the Friendly Islands, although there is more frequent damage done on the latter than on the former. The track of the hurricane appears to be between the groups.

CLIMATIC PECULIARITIES.

The Governments of the United States and Great Britain have gathered and collected all information in any way appertaining to climatic, hygienic, and meteorological phenomena belonging to the Samoan Islands, and from the various reports may be gathered a vast amount of information that will be of interest to the general student. That any light will ever be thrown upon the immediate cause of a cyclone is a matter of extreme doubt. So far, it has been extremely difficult to ascertain the near approach of a tornado, so as to be able to guard against its effects. An English authority, speaking of the climate of Samoa, says:

"The climate of the islands may be termed variable, and there is much bad weather, particularly during the winter months, when long and heavy rains, attended at times with high winds and northerly gales, are frequent. Destructive hurricanes also occur, sometimes blowing down the towns and destroying the houses. Although these severe hurricanes do not happen very frequently at the Samoan Islands, yet it is probable that they occur very frequently between them and the Friendly Islands, where scarcely a season passes without some of the islands suffering from one of these awful catastrophes."

HURRICANES IN THE PACIFIC.

The same authority speaks of the hurricanes of the Pacific in the following language:

"In the Pacific, like many other of the phenomena there met with, the recorded observations on hurricanes or typhoons are too scanty to have drawn up any regular system for them; so that for the present it remains

for the navigator to apply 'the law of storms' as developed in the Atlantic and Indian Oceans to these same meteors in the Pacific, and almost without question they will be found accordant, in most instances, with that law.

"In the Southern Pacific we have a groundwork to assert the character and occurrence of the true cyclones, and as Mr. Piddington states almost all that need be said on the subject, we quote his words:

"'In the tropical regions of the South Pacific, from the barrier reefs of Australia through the numerous groups of islands to the low archipelago, and perhaps even to near the coast of South America, and from the equator to latitude 25° south, there is no doubt that true hurricane storms (cyclones) occur of as great violence at least as those in the North Pacific; but from the scattered accounts of single ships, as also of missionary residents on the various islands, we cannot say anything positive as to their tracks, though they appear to come from the eastward among the islands, and sometimes to curve to the southward. The following are a few notes. The seasons at which they prevail seem also to be the same as those of the Mauritius and Bourbon:

"'At Viti-Leon, in the Fiji group, in February, 1841, a well-defined circular storm (cyclone), tolerably observed, seemed to have moved to the southward, and, though it lasted four days, was not felt at Tonga, eight or ten degrees to the southeast of it.

"'At Apia harbor, in the Samoan group (Navigators' Islands), latitude 14° south, on the sixteenth day of December, eighteen hundred and forty, a true hurricane storm (cyclone), of great violence, with a fall of four inches of the mercury (by a damaged barometer) was observed, moving from the north to the southward; and, four years previous, another, also well defined, moving from the northeast to the southeastward, the change of wind being from southeast to northwest. The space between the Samoan (Navigators') Islands and Friendly Islands is said expressly to be subject to violent hurricanes, and that scarcely a year passes without some of the Friendly Islands suffering from them. Their violence is such that many of the American whalers have been made complete wrecks of by them; two were lost about 1842 (year uncertain) at the Navigators' Islands.

"'At the Kingsmill group, on the equator, violent storms, which appear to be typhoon-like, are experienced.

"'At Vavroo, in the Friendly Islands, latitude 19° south, longitude 173° west, in 1837, the American whaler Independence was driven on shore by 'a hurricane,' and taken off by a shift of wind.

"'The account of the storm at Raratonga, in the Hervey Islands, in latitude 19° south, longitude 160° west, described by Mr. Williams and quoted by Colonel Reid, gives us, unfortunately, nothing further than the certainty that hurricanes (cyclones) prevail there at times.'"

Without quoting literally from this authority any further, from the same authority are collated the facts that in December, 1842, H. M. S. Favorite, between Tahiti and Mangeea, met with a rotary storm; in February, 1840, a cyclone, bearing southwestward, visited the Bay of Islands, New Zealand; July 28, 1849, H. M. S. Buffalo was wrecked in a heavy gale, which lasted three days, at Mercury Bay, New Zealand; rotary storms have been experienced between Van Diemans Land and Cape Horn; a heavy gale off Cape Tres Puritas, April 5, 1882; another in the same latitude and longitude, April tenth of the same year; one swept the Bay of Camavos to the Island of Desegada in May, 1846, during which twelve English and American vessels were lost. The record from which this data is taken, "Hurricanes of the South Pacific Ocean," by Alexander George Findlay, F.R.G.S., mentions the circumstance that in every instance where it was possible to

make observations these storms were rotary in their character, vessels being driven all around the compass in a gale, the course being from left to right. Information with reference to storms between 20° south of the equator and the Gulf of California is deficient. The conclusion is drawn, however, that the storms on the coasts of Nicaragua, Guatemala, and Mexico, are connected with the Gulf of Mexico, or perhaps originated there.

NOTES ON REVOLVING STORMS.

Diagram A—The spiral lines illustrate the circulation of the wind in a tropical cyclone, northern hemisphere. In the southern hemisphere the circulation takes place in the opposite direction. The diameter of the area represented may vary in different storms and in different latitudes from about one hundred to about eight hundred miles, and is generally least in low latitudes. The air is drawn in toward the center of low barometer, gradually takes up a more and more circular path as its velocity increases, and finally whirls around the center with hurricane force. At the center is a calm spot from ten to thirty miles in diameter; this is marked low, and here the lowest barometer is obtained. It will be noticed how similar the motion is to that of water in a whirlpool or eddy, and very naturally, as this is nothing but a gigantic whirlpool in the atmosphere, and the suction or draught at the center upward instead of downward.

The direction of the wind at any point on this diagram is the same as the direction of the curve at that point, and the arrows show this direction at the point where they are plotted. By plotting arrows at all points having the wind from the same direction—north, for example—and joining them by a dotted line, we find that this dotted line curves toward the center, as shown. The angle of bearing of the center, therefore, gradually decreases from about ten points at the margin to about eight points in the inner whirl, where the well known "eight-point rule" becomes true.

Diagram B—Here the dotted lines are drawn from each wind arrow at the margin to the center, in the way explained above, so that to find the direction of the wind at any point, follow out the dotted line to the margin, and read it there. The circles are isobars, and the barometer falls twenty one hundredths of an inch as you go from one of these circles to the next inner one. This illustrates very clearly the rate at which the barometer falls as you approach the center; first slowly, as the broad outer ring is traversed, then more rapidly.

Near the center, where the isobars are very close together, it has been known to fall an inch in fifty miles. Of course, as you recede from the center, the barometer rises .20 of an inch as you pass from one isobar to the next outer one, just as it fell on entering the hurricane. This diagram involves as much of our latest knowledge of cyclones as can be safely used as a general guide, and extends out beyond the regions where the barometer is falling rapidly and the wind and sea have become violent. These diagrams and the accompanying explanations only indicate how you may plot your position on the diagram, and obtain from it the probable bearing and distance of the center, and the track and velocity of the storm, leaving it to yourself to decide what action to take, having proper regard to the strength and speed of your ship, the lay of the land, and the passage you are making.

Practical use of Diagram B: Suppose that at 4 P. M., for instance, the wind is E.S.E., and the barometer .20 of an inch below the normal. Find at the margin of the diagram the wind arrow marked "E.S.E.," and follow the dotted line in towards the center as far as the isobar marked ".20 of

an inch below the normal;" this intersection (marked "a") is your position on the diagram; for, by the method of construction just explained, this is the place, and the only place, where the wind is E.S.E., and, at the same time, the barometer .20 of an inch below the normal. Referring to the compass and scale which accompany the diagram, you will find that the center (low) bears S.W. by S., distance two hundred and fifty-two miles. Plot this position of the center on your track chart from the 4 P. M. position of your vessel.

Later in the day, say 8 P. M., suppose that the wind is S.E. by E., and the barometer is .30 of an inch below the normal (having fallen .10 of an inch in the interval): With this wind your position must be half way between the dotted lines leading in toward the center from the arrows marked "S.E." and "E.S.E.," and with this barometer reading it must be half way between the isobars marked ".20" and ".40" below the normal; it is, therefore, at the point marked "b," and the center bears "S.W.," distance two hundred miles. Plot this 8 P. M. position of the cyclone center on your track chart from the 8 P. M. position of your vessel.

You have thus the position of the cyclone center at 4 P. M. and at 8 P. M. plotted on your chart, and the dotted line joining the two positions is the track of the center and the distance it has moved in four hours.

Suppose, again, that at 10 P. M. the wind is still from S.E. by E., but the barometer stands at .40 below the normal, having fallen .10 in two hours. Your position is now at the point marked "c" on the diagram, found by exactly the same course of reasoning as before, and the center now bears S.W., distant about one hundred and seventy-five miles. Plot this 10 P. M. position of the center on your track chart, from the 10 P. M. position of your vessel. If you have been lying-to, this will evidently indicate that the storm's track has recurved, and that you are directly in front of the center. But, no matter whether you have been lying-to or not, your vessel's track and the track and position of the cyclone center are both plotted on your chart, and you can closely watch every change in relative position in order to avoid the center and dangerous semicircle of the hurricane.

NOTES ON REVOLVING STORMS.

The subject of revolving storms, cyclone, hurricane, or tornado, has been made the subject of a special bulletin of the Branch Hydrographic Office of this city. The information is for the special benefit of mariners, and it will be to their interest to note carefully the statements therein contained, and they can compare them with their experience. The following are the notes:

EARLIEST INDICATIONS.

Barometer above the normal, and continuing so quite noticeably for several days, with dry, fresh, fair weather and uncommonly transparent atmosphere. The formation, in increasing quantities, of light, feathery, cirrus clouds, and the setting in of a long, low, ocean swell from the direction of the approaching storm. The long lines of filaments of cirrus clouds also often indicate the bearing of the storm-center while it is still hundreds of miles away, as they radiate from it on every side. As the cirrus clouds gradually thicken, halos begin to appear about the sun and moon, and the ocean swell increases.

UNMISTAKABLE SIGNS.

As the sky becomes overcast with a light vail of cirrus clouds, with halos and rings about the sun and moon, the barometer begins to fall, slowly but steadily. The atmosphere loses its pleasant freshness and seems very heavy, hot, and moist. Dark red and violet tints are seen at the rising and setting of the sun, deepening in intensity day by day. Soon the cloud bank of the storm appears on the horizon like a distant mountain range, the barometer falls more rapidly, the wind freshens, and the first nimbus and cumulus clouds appear, with light squalls and passing showers.

GENERAL RULES.

Watch carefully for the earliest indications of the approaching hurricane; constantly and carefully observe and record the barometer, thermometers, wind, and weather. When one is evidently approaching, heave-to, carefully make and record your observations every half hour, or even more frequently; make every effort to find the probable bearing of the center, direction in which the storm is moving, and the semicircle you are in. Unless you heave-to when thus observing the fall of the barometer and the shifts of wind, you may be led into serious error; a fast steamer, for instance, may run into the dangerous side of a hurricane and yet get shifts of wind characteristic of the navigable semicircle. Any attempt to cross the storm track is dangerous, but should you decide that it must be attempted, crowd sail and keep the wind well on the starboard quarter, if in the Northern Hemisphere, or on the port quarter, if in the Southern Hemisphere. If obliged to lie-to, always do so on the coming-up tack; in the dangerous semicircle this will be the starboard tack in northern latitudes, and the port tack in southern latitudes; the ship will head away from the center, and you should make all the headway you can; in the navigable semicircle it will be the port tack in northern latitudes, and the starboard tack in southern latitudes; the ship will head toward the center, and you should make as little headway as possible. In scudding, always keep the wind on the starboard quarter, if in northern latitudes, but on the port quarter if in southern latitudes, in order to run out of the storm. So long as the barometer continues to fall the center is getting nearer; when it steadies and begins to rise, this marks the nearest point, and here the shifts of wind will be most sudden and violent, and the sea highest and most confused. If when lying-to the wind begins to shift in a direction opposite to what it did at first, it is evident that the storm track is recurving, and that your semicircle has changed. Immediate action must be taken to suit the new conditions. But if your vessel is making any great headway, it may give you a shift of wind contrary to what you would have if lying-to. This must be borne in mind. In West Indian hurricanes cool weather is characteristic of the navigable semicircle, owing to the indraft from the northwestward; warm weather, on the contrary, indicates the dangerous semicircle, where the air is drawn in from the southeastward.

There are two cyclone currents to be considered—a current moving in a circular direction around the center, caused by the wind, and a current which follows the storm along its track. These vary considerably with different storms, but should always be taken into account when near the coast.

The rule for the determination of the semicircle is the same for both hemispheres; if the wind shifts to the right, that is, from north towards east, from east toward south, and so on, you are in the right semicircle; if

it shifts to the left, that is, from north toward west, and so on, you are in the left semicircle. In northern latitudes the right is the dangerous semicircle, and the left the navigable semicircle, but in southern latitudes the case is reversed, the left becoming the dangerous side and the right the navigable side. The following are general rules for guidance under ordinary circumstances:

In northern latitudes, right semicircle.—Haul by the wind on the starboard tack and carry sail as long as possible; if obliged to heave-to, do so on the starboard tack.

Left semicircle.—Bring the wind on the starboard quarter. Note the direction of the ship's head and steer that course. If obliged to heave-to, do so on the port tack.

On the storm track, in front of the center.—Square away and run before it. Note the course and keep it; trim the yards when the wind draws on the starboard quarter. If, however, obliged to heave-to, do so on the port tack.

In rear of the center.—Run out with the wind on the starboard quarter, or heave-to on starboard tack.

In southern latitudes, right semicircle.—Bring the wind on the port quarter. Note the course and keep it. If obliged to heave-to, do so on starboard tack.

Left semicircle.—Haul by the wind on the port tack. Carry sail as long as possible, and if obliged to heave-to, do so on port tack.

In front of the center.—Run before it. Note the course and keep it, and trim the yards as the wind hauls on the port quarter. If obliged to heave-to, do so on starboard tack.

In rear of center.—Run out with wind on port quarter or heave-to on port tack.

All of the above maneuvers depend, of course, on the amount of sea room and the ability to carry sail. If sail cannot be carried or land interferes, the ship should be hove-to on the starboard tack in the right semicircle, and on the port tack in the left semicircle, and never otherwise, no matter what may be the latitude.

The following, compiled from information on file in the Hydrographic Office, is supplementary to what was published in a special bulletin in 1888, having reference more particularly to storms in the Northern Hemisphere:

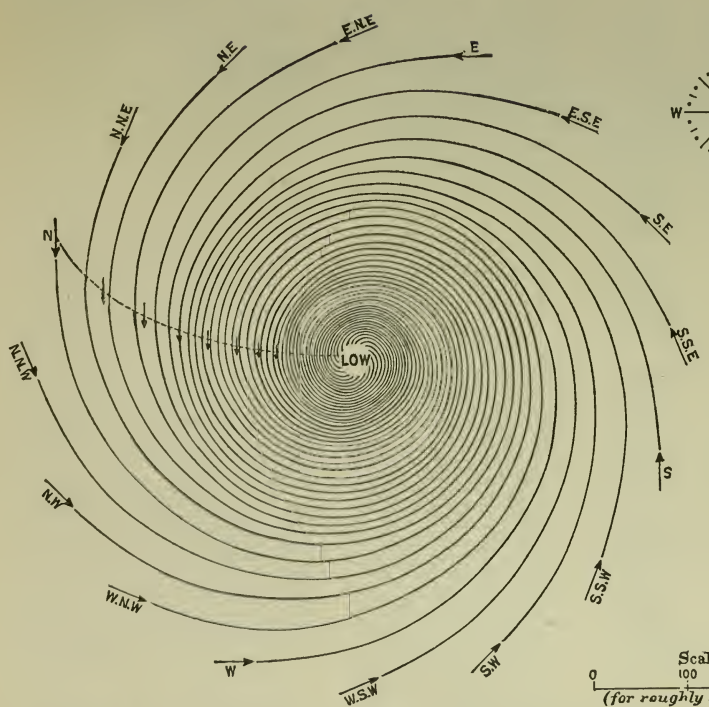
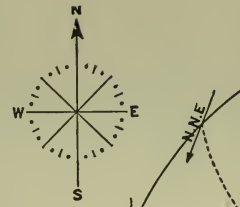


DIAGRAM A.—Illustrating the circulation of the wind around and toward the center of low barometer in a tropical cyclone, Northern Hemisphere. The dangerous winds occur in the inner whirls.



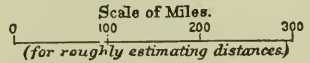


DIAGRAM B.—For practical use in finding a ship's position relative to the center of a tropical hurricane, Northern Hemisphere, by means of the direction of the wind and the fall of the barometer.

CORRECTIONS, ETC., OF THE ABOVE ARTICLE AS FURNISHED BY LIEUTENANT H. P. McINTOSH, U. S. NAVY, AND OFFICER IN CHARGE OF THE U. S. BRANCH HYDROGRAPHIC OFFICE, SAN FRANCISCO.

SIR: I inclose you a copy of a "Bulletin" issued by this office, which contains some notes on revolving storms. Increased knowledge of the subject has made it necessary to modify somewhat the instructions for maneuvering in the rear of a cyclone. We find that in the rear of a cyclone, not only in the tropics, but in the temperate zones, the wind blows almost directly toward the storm center; so that it would be better to heave-to and wait for the cyclone to recede, in the meantime watching the shifts of wind to see that the storm is receding and not recurving; it might even be better to stand off close-hauled on the tack opposite to that recommended by the "Bulletin." The conclusions of the "Bulletin" were derived from the diagrams, which are, of course, only general, and not applicable as a guide for action in the rear of a cyclone. The trouble is that it is impossible to represent by a single diagram that the winds are more in-blowing in rear, because the rear is east in low latitudes; south in middle latitudes in the northern hemisphere; north in middle latitudes in the southern hemisphere; and west in high latitudes. To do so would require three diagrams for each hemisphere.

Very respectfully,

H. P. McINTOSH,
Lieutenant U. S. N., in Charge.

THE SAN FELIPE SINK, SAN DIEGO COUNTY, CALIFORNIA, AND ITS INTERESTING DETAILS AS A HEALTH RESORT.

The following article was taken from the "American Meteorological Journal" for March, 1889, published by Professor M. W. Harrington, Director of the Astronomical Observatory, Ann Arbor, Michigan:

Dr. Walter Lindley, in the "Medical Record," gives an interesting account of this tract, which lies below sea level. Dr. Lindley discusses it from the therapeutic point of view, claiming that in it the patient can get the curative effect of compressed air. As to its physical peculiarities, fauna, and flora, Dr. Lindley says:

Dr. J. B. Widney, of Los Angeles, while surgeon in the United States Army, crossed this region with troops twenty-one years ago. He then noticed surrounding this territory a well-defined line along the mountain sides, always at the same level. Above that line the rocks are sharp and jagged, showing that for ages the water had stood at that level. He says: "I found it to be the old beach of a sea." I find nothing else noted of this country until the surveying party of the Southern Pacific Railroad, in running the line from Los Angeles to Yuma, found that sea level was at the point where Dr. Widney had noted the ancient beach. They then gradually descended to the south until they reached a depression of two hundred and sixty-eight feet below sea level, at a point near Salton.

This basin is about one hundred and thirty miles in length by thirty miles in average width. The deepest point is about three hundred and sixty feet below sea level. Along the northern margin of this basin, right up against the mountains, are great numbers of date palms. These tropical trees are indigenous to this valley, and many of them reach a height of eighty feet. When ripe, a single bunch of the fruit weighs one hundred pounds. It has a taste very similar to the date palm of commerce. The tree has large fan leaves, and is the same as can be seen in almost every park and yard in the towns of Southern

California. The passenger on the Southern Pacific Railroad, by glancing out of the north side of the car at Indio, can see these giant sentinels keeping silent vigil over the plains beneath them.

At Salton, on the Southern Pacific Railroad, the surface of the earth for nearly ten miles square is covered with a crust of salt from four inches to a foot thick. I stopped there in midsummer, and went out on this great white field about noon. The mercury indicated 105 degrees Fahrenheit in the house, but out in the sunshine, with the dazzling reflection from the glistening surface that extended for miles on each side, the temperature was probably 130 degrees Fahrenheit. The workmen out in this peculiar harvest field were as cheerful as any set of men I ever saw, and there was far less exhibition of suffering from heat than is to be seen, ordinarily, in July in the wheat fields of the Mississippi Valley. The low relative humidity explains the total absence of sunstroke here. The atmosphere in this region, adulterated by the chlorine gases emanating from the salt beds, must be nearly aseptic. There are extensive mills here for grinding the salt. It is not put through any system of purification, but, after grinding, proves to be excellent for table use. Several hundred tons are thus prepared every month, and shipped away.

A few miles east of here are the famous mud volcanoes, which are equal in wonder to the geysers of this State. Owing to the treacherous character of the ground around them they have never been thoroughly examined. Professor Hanks, the State Mineralogist, undertook it, but, breaking through the crust, he was so severely burned that he was compelled to abandon his investigations. Here is an extensive, almost unexplored field for some adventurous scientist.

Indio is the place to stop and make headquarters for tours through this interesting country. It is the principal station in the valley, and is near the northern rim of the basin, being only twenty feet below sea level. The sandy plains around Indio were formerly considered a hopeless barren waste, but the advent of the railroad has made great changes. Good water is supplied by surface wells; but in order to have water for irrigation, artesian wells have been bored. There is one, two and three fourths miles east of Indio, that is now flowing one thousand gallons per hour. This flowing water was reached at a depth of only one hundred and fifteen feet, after boring through layers of sand, clay, sand, tough blue clay, clay, coarse gravel, clay, and sand. Oranges and various other kinds of fruit are being grown here, and melons, tomatoes, and berries ripen several weeks earlier than at Los Angeles and other places near the coast. There are in this vicinity about forty thousand acres of excellent land. The visitor here, on witnessing the water flowing from the artesian wells, the grass growing, the melons ripening, and the peach trees blooming, can fitly say with Isaiah: "The Lord shall comfort all the waste places. He will make the desert like the garden, and the desert shall rejoice, and bloom as the rose. For in the wilderness shall waters break out, and streams in the desert. And the parched ground shall become a pool, and the thirsty land springs of water."

In this valley live about four hundred of the Cohuilla Indians. This is an interesting tribe. Dr. Stephen Bowers, in a paper read before the Ventura County Society of Natural History, March 5, 1888, said that he believed them to be of Aztec origin. They are sun and fire worshipers, and believe in the transmigration of souls, and that their departed friends sometimes enter into coyotes, and thus linger about their former habitation. They practice cremation. Their principal article of food is the mesquit bean, which they triturate in mortars of wood or stone, after which the meal is sifted and the coarser portion is used as food for their horses and cattle, and the finer is made into cakes for family use.

The agave, or century plant, which is indigenous here, is also much used for food. The roots, roasted, taste like stewed turnips, while the stem, roasted, is said to taste like baked sweet potatoes. From this plant they also make the Mexican beverage, *pulque*, which has about the same alcoholic strength as beer. The ethnologist can, by gaining their confidence, get much interesting information from these very peaceable Indians.

I found at Salton and Indio asthmatics, rheumatics, and consumptives, all of whom reported wonderful recoveries. Some of these stories I accepted *cum grano salis*, which quotation is, by the way, especially applicable to the salt fields. These asthmatics and consumptives claim that the further they get below the sea level and the drier the atmosphere, the easier they breathe. The rheumatics claim that the heat and dryness improves the circulation, and thus relieves them.

Among other places below sea level, Lindley notes the sink of the Amorgosa (Arroyo del Muerto), in eastern California, two hundred and twenty-five feet below sea level. The Caspian Sea, eighty-five feet below sea level. Lake Assal, east of Abyssinia, in the Afar country, eight miles long and four miles wide, is about seven hundred and sixty feet below sea level. Its shores are covered with a crust of salt about a foot thick.

WEST INDIAN HURRICANES AND THE MARCH BLIZZARD OF 1888.

From "Forest and Stream."

On February 9, 1889, a most interesting lecture was delivered by Ensign Everett Hayden, U. S. N., in charge of the Division of Marine Meteorology of the U. S. Hydrographic Office, before the Seawanhaka Corinthian Yachting Club, the subject being "West Indian Hurricanes and the March Blizzard." The lecture was very fully illustrated by a series of lantern slides prepared from Mr. Hayden's diagrams and exhibited by Mr. William T. Buckley, a member of the club. Through the kindness of Mr. Hayden we are enabled to give the following abstract of his lecture, its length being too great to allow its publication in full:

As a lecture, to be delivered at a future time, will be devoted to the general subject of winds and storms, a very much more comprehensive one than that now under consideration, it is to be hoped that a somewhat detailed description of the terrific tropical cyclones that devastate the West Indies and advance upon our Gulf and Atlantic seaboard will be a fitting introduction to a broad general outline of the meteorology of the globe, to which the present lecture is merely preliminary. Moreover, it was by the study of these very storms that an American, William B. Redfield, won imperishable renown and the everlasting gratitude of mankind by discoveries that have proved to be the very foundation stone of the great science of meteorology as it is known and practically utilized to-day, at sea and on land, in every ocean and continent of the globe to which the arts and sciences of civilization have access.

The first three slides, modifications of the familiar pilot charts of the North Atlantic, will serve to make clear the general distribution of barometric pressure and the circulation of the winds over the entire basin of the North Atlantic and the adjacent continents during winter and summer, together with the general paths followed by storms, and the regions where they are most prevalent and persistent. Special attention is called to the great persistent anti-cyclone, or area of high barometer, in mid-ocean to the southwest of the Azores, about which the general atmospheric circulation is in a direction with the hands of a watch, giving rise, below, to the well known steady northeast trades, and above, or to the northward, to the prevailing westerly winds along the transatlantic steamship routes—the "brave west winds" of the north temperate zone. Another marked feature is the permanent area of low barometer about Iceland, a great stationary cyclone about which the circulation of the wind is against the hands of a watch. To the southward, about the equator, lies what Maury has called the meteorological equator, the region of equatorial rains and calms at the meeting of the southeast and northeast trades, where the warm, steady trade winds, laden with moisture from their long travel over tropic seas, rise and precipitate their moisture, returning polewards as an upper current, to descend again to the surface and be felt as cool, dry, anti-cyclonic winds. The position of this great anti-cyclone in mid-Atlantic is the key to the meteorology of half the civilized world; the diagrams indicate its normal or average position, and illustrate how it follows that great monarch of climate, the sun, in his changes of declination, moving north-

ward in summer and southward in winter. But they do not illustrate the abnormal variations in its position, due to, we know not what, though we do know that the storms of America and Europe are guided by it, and the next great step in advance will be to turn this knowledge to practical account in our forecast of weather on the North Atlantic, and along its eastern and western shores.

In addition, then, to those permanent areas of high and low barometers, eddies or atmospheric whirls move along pretty well defined tracks, as indicated on the diagram; cyclones, or "lows" (in ordinary parlance, storms), sucking the air spirally inward and whirling it aloft, its moisture condensing into heavy clouds, with rain or snow; anti-cyclones, or "highs," returning the cool, dry air to the surface in outward blowing spirals, with cool dry weather and high barometer. The two storm tracks of spiral interest in this connection are: first, the Great Lake storm track, from west to east over the Great Lakes and down the St. Lawrence Valley; and, secondly, the West Indian hurricane track, westward in the tropics, then northward into the temperate zone, and eastward again in higher latitudes. Cyclonic eddies tend to move toward and unite with the permanent "low" near Ireland; anti-cyclonic, with the permanent anti-cyclone in mid-ocean. Upon these general laws, together with local modifications due to topographic relief ashore and the influence of the great ocean currents at sea, hang all the weather changes of the North Atlantic basin.

After this general view the lecturer said that he proposed to confine his attention to the western portion of the ocean, that portion which an eminent American scientist has well called the "Bay of North America." This term embraces all of the Atlantic west of the fiftieth meridian, from Newfoundland to the mouths of the Amazon, including the Caribbean Sea and the Gulf of Mexico. He did not propose, he said, to leave to a postscript what he himself regarded as by far the most important point that any thorough study of West Indian hurricanes and the March blizzard could possibly emphasize, namely, the tremendous commercial importance of this great Bay of North America. The area from the fiftieth to the one hundredth meridian west of Greenwich, and from the equator to the fiftieth parallel of north latitude, is destined to become, in the near future, the theater of the greatest political and commercial activity that the world has ever seen. Meteorologically speaking, it is a unit from the slopes of the Rockies and the Cordilleras of the Isthmus to mid-ocean, and from the shores of the Hudson Bay to Venezuela. Abercromby, the distinguished English meteorologist, has well said that the weather predictor "cannot explain the weather on any day without casting his eyes over the whole northern hemisphere and around the little hills and valleys which bound his own horizon." Urging his hearers to bear this in mind during his subsequent remarks, and promising to refer to the subject again, he went on to describe Redfield's great discoveries, the methods by which his results were obtained, and their immediate and practical effect in advancing meteorological knowledge and lessening the dangers of ocean storms.

Although it is now generally recognized that Redfield had reached his fundamental conclusions regarding the rotary character of storms, together with a motion of the whole system along a definite track, as early as 1821, yet his first paper did not appear in print till 1831, and was even then unaccompanied by the diagrams so necessary in the then state of knowledge, or rather ignorance, of the subject. Nevertheless, most of his earliest papers were accompanied by such full statements of methods and facts that any one could plot the observations on a chart and thus verify his conclusions for himself. To illustrate his method, therefore, Mr. Hayden selected one

of his later diagrams, entitled "Route of the Hurricane, October 4–7, 1844," and projected it upon the screen. Upon this chart Redfield had charted by means of arrows, plotted each one at its proper geographic position, observations of wind direction selected for certain fixed times from a large number of reports, extracts from ship's logs, etc., collected with infinite perseverance and care from as many sources as were accessible. Thus three sets of concentric circles are seen at a glance to represent the general size and character of the storm at noon of the fifth, sixth, and seventh of October, respectively. Moreover, the tracks of certain vessels are plotted, in order that the experience of each may be considered with reference to the circulation of the wind about the storm center and the gradual movement of the whole system along a curved track. Thus we have here on Redfield's chart as clearly and graphically as could be indicated from the data at his command by the most able meteorologists to-day, the whole theory and practice of all our modern synchronous daily weather maps upon which predictions and forecasts are based and spread abroad by telegraph and newspapers to form part and parcel of the daily life of millions of men in every land. October fifth, a cyclone central off the northern coast of Cuba, easterly gales in Florida, northerly in western Cuba, westerly in Jamaica, southerly in eastern Cuba. October sixth, cyclone central two hundred miles southeast from Hatteras, general circulation of wind about the same as before (against the hands of a watch), northeasterly gales from Sandy Hook to Hatteras, northwesterly gales from Hatteras to Cape Romaine, size of storm somewhat greater. October seventh, storm central about one hundred and fifty miles southeast from Halifax, increasing southeasterly gales on the Grand Banks, strong nor'wester between Cape Sable and Nantucket, storm area enlarging and intensity diminishing. How marvelously clear. What a perfect grasp of facts and what a grand practical generalization from facts to principles. It would, indeed, have been small credit to the age in which he lived had such self-evident truths failed to find ready acceptance and prompt appreciation.

The terrific violence of this hurricane was sufficiently indicated by the havoc it caused in the landlocked harbor of Havana, a port absolutely unrivaled for the security of its anchorage; in this ten hours' tragedy seventy-two ships foundered at their anchors—capsized, dismasted, driven ashore, annihilated by the fury of the hurricane. This is a splendid landlocked harbor, and in spite of all that human strength and skill could do aboard, the various vessels of a great fleet, fighting under every flag and allied against a common foe, were wrecked and shattered by the hurricane. Attention was called to a coincidence of marked importance between the date (1844) of this great storm, so fully and graphically explained by Redfield, and the very year that witnessed the completion and assured practical success of Professor Morse's telegraph line between Washington and Baltimore. Right here we have the two great practical discoveries upon which all modern telegraphic weather forecasts depend—the synchronous observations and records, and the electric telegraph which transmits them.

Without attempting to follow this gigantic whirlwind in its destructive path towards Hatteras and the Grand Banks, the speaker paused a moment to refer to Redfield himself, and read an extract from a very interesting letter from Rear-Admiral Thornton A. Jenkins, U. S. N. (at that time a passed midshipman), an officer whose distinguished record at home and abroad, in peace and in war, is well known to every student of American naval history. Admiral Jenkins describes Redfield as a quiet, retiring, and reticent man, but always eloquent and patient in explaining the great truths of his new—and in the then ignorance of the subject—startling theories.

It seems almost incredible that at that time the great majority of naval officers, even, utterly refused to believe in or even listen to any theories regarding storms at sea or on land, and regarded a barometer as more or less of a nuisance. As late as 1850, Admiral Jenkins, says a naval officer, who afterwards became one of the most distinguished heroes of the war, asked him if he put any faith in "that thing." "Why, when I was in the Gulf and at Vera Cruz," said he, "that d——d thing nearly set me crazy."

The next diagram shown upon the screen was one of Redfield's track charts, with the path of various hurricanes, illustrating as graphically as anything could well do the general limits of the great area already defined as the Bay of North America, the tracks along which these terrific cyclonic storms move in their majestic parabolic orbits from the tropics into the temperate zone, and the essential unity of the entire area, so far as any broad and rational scheme of telegraphic weather forecasts is concerned. This latter fact, however, was referred to and emphasized still more strongly later on, in connection with a full description of the physical and meteorological features of the Bay of North America, and the existing and proposed telegraph lines and cables, so it need not be referred to further here. Attention was called to the fact that, while some of these storms pursued a course about west by north across the Caribbean Sea and Gulf of Mexico, reaching the coast of Texas before recurving, others recurve in various latitudes, the greater number about the thirtieth parallel, following a path very nearly coincident with the course of the Gulf Stream, and approximately parallel to our Atlantic Coast line. Again, a careful study of the dates of even the comparatively few storm tracks plotted on this chart brings out the fact that the August hurricanes recurve well to the northward, about the thirtieth or thirty-third parallel, while those of October recurve in about the latitude of Cuba. These important general laws, dependent upon the change of the sun's declination, have been strongly confirmed by subsequent investigation, and were discussed in greater detail later in the evening. One other feature of this chart that was referred to particularly, was the notable irregularity in the track of the hurricane of August, 1887, which, after having already commenced to recurve in the usual manner, was unexpectedly deflected to the westward, striking the coast of Georgia at Darien. This circumstance the audience was requested to bear in mind in connection with similar deflections of certain recent hurricanes, when the principles governing such deflections would be fully explained.

The next diagram was a copy of the Pilot Chart of the North Atlantic Ocean for August, 1888, on which were plotted the tracks of all the August hurricanes on record, strikingly confirming the fact brought out by Redfield's chart, that these tracks are remarkably uniform, both in their general course and in the latitude where they recurve.

Diagrams from Colonel Reid's well known book on storms served to illustrate the way in which able, practical, and scientific men took up Redfield's ideas, and propagated his new and important theories among navigators, for their guidance at sea in avoiding altogether, or maneuvering successfully in ocean storms. Colonel Reid was an officer of the Royal Engineers of Great Britain, and his attention was first directed to this subject from having been employed at Barbadoes in reëstablishing the Government buildings blown down in the hurricane of 1831, when one thousand four hundred and forty-seven persons lost their lives in the short space of seven hours, in that little island alone; a striking commentary, in itself, of the destructive character of these gigantic tornado-like whirlwinds. The diagrams were especially graphic in clearly defining the broad belt or swath

described by a hurricane in its outward progress, the storm tracks previously referred to constituting merely the axial line of the belt. The first was a hurricane of August, 1837, and a graphic account was quoted, with illustrations, of a thrilling experience of the ship Calypso, typical of hundreds of similar cases in hurricanes in the West Indies and off our own coast in the past, and repeated every year almost before our very eyes. The Calypso was in about latitude 27° north, longitude 75° west, when a rolling swell, freshening northeasterly squalls, and other signs of a hurricane, would have warned a captain posted in the law of storms to square away and make the best of his way to an anchorage at Nassau or run around along the southern edge of the approaching cyclone. But this was before sailors knew anything about circular storms, and before the Hydrographic Office had spread broadcast over the world the marvelous results obtained by using oil to prevent heavy seas from breaking on board. The ship's decks were swept by the seas, her close-reefed topsail blown from its bolt ropes, hatches stove in, the vessel thrown on her beam ends, with yard arms in the water. With her crew of fifteen men clinging to the weather rigging, mastheads in the water, a furious hurricane dashing the waves over them in sheets of foam, and the vessel sinking beneath their feet, it seems hard to believe that any epitaph but "missing—lost at sea" would ever have been inscribed against their names. But truth is always strange, stranger than fiction. Upon cutting away the lanyards of the lower rigging the masts went by the board and the vessel slowly righted. As the gale moderated, jury masts and sails were rigged, and in two weeks' time, after the hardships and sufferings incident to such a condition, the gallant ship (what was left of her) came to anchor in the harbor of Smithville, North Carolina.

Another of Reid's diagrams gave the paths of two of the memorable hurricanes of October, 1780, as indicated by extracts from the logs of the many British frigates cruising in those waters at that time. The one that destroyed the town of Savanna la Mar, Jamaica, was particularly severe, and in the vicinity of that island four frigates were lost, three of them with all on board. The Phœnix, wrecked on the south coast of Cuba, had a terrible experience, and the long account of it by Lieutenant Archer, R. N., published in Reid's book, should be read in full, as no quotations could do it justice. One's feelings relative to the loss of this fine frigate, however, are somewhat tempered by the cool way in which Lieutenant Archer speaks of having chased a Yankee man-of-war a short time previously, which, "unfortunately," escaped in the darkness.

Two years later (1782) occurred one of the greatest naval disasters on record, and the lecturer said that—after referring to it very briefly in order to emphasize the vast importance to navigators of a knowledge of the law of storms, rather than with any desire to appall the audience with statistics—he would be obliged to omit all further reference to the accumulated records of the succeeding hundred years and devote to the immediate present what little time remained. The disaster referred to he quoted from Piddington's "Sailor's Horn Book," another of those classic manuals that have translated and made intelligible to rough practical men the great and important truths of pure science, whose lofty reasoning and diction would in themselves be as unintelligible as so much Sanscrit. Rodney's fleet and prizes, together with an immense convoy of merchantmen, in all ninety-two vessels, were overtaken by a hurricane off the Grand Banks in September, 1782; all preparations for bad weather were made and the fleet hove-to, but on the wrong tack. Frigates, prizes, and convoy were dismasted, sunk, scattered, abandoned; every man-of-war but one foundered, and upward of three thousand lives lost. Hove-to on the wrong tack. What an epitaph,

and what a lesson for posterity! Truly, "peace hath her victories no less renowned than war," and if Redfield has still no monument erected in his honor, it must be because he needs none.

Mr. Hayden then explained by means of diagrams prepared in his division, and published by the Hydrographic Office, the circulation of the wind in a tropical cyclone, northern hemisphere, upon a knowledge of which the proper handling of a vessel depends. As a good illustration, the experience of the United States steamer Juniata was cited. This vessel is now in New York harbor, having recently returned from China, where last September she encountered a severe typhoon during her voyage from Hongkong to Singapore. The diagrams illustrated graphically the structure of those great whirlwinds, so far as concerns the navigator, showing that while in the outer regions of the storm the wind blows spirally inward, in the central regions it rushes furiously around a calm spot called the eye of the storm, where there is a fearful pyramidal sea, the waves rising and falling in mountainous and irregular masses, oftentimes with a clear sky and bright sunlight to enhance the strange and unnatural calm in the midst of a ring where the wind is blowing a hurricane, the sea lashed into driving foam, and the sky of inky blackness. The diagram indicated how aboard a vessel to the right of a storm track, the wind shifts to the right (veers), and to the left it shifts to the left (backs). Directly in front of an advancing storm the wind remains steady in direction, but increases rapidly in force, with light scud and passing squalls. By means of these and many other characteristic indications the navigator can ascertain with considerable accuracy the bearing of the storm center and the approximate track and velocity of the cyclone. He is thus enabled to take such action as may be best adapted, considering the particular circumstances of the case, to avoid the most dangerous region of the storm, and as a secondary consideration take advantage of such winds as may help him on his course. One of the most important circumstances the practical navigator has to consider in dealing with a hurricane is the lay of the land, and, of course, the proximity of a dangerous coast must often prevent him from taking such action as would be most advantageous if there were plenty of sea room. In the case of the Juniata, Commander Wise stood away to the southward to avoid the typhoon, and at the same time make headway on his course to Singapore, and, finally, rather than cross the entrance to the Gulf of Tonquin, where the sea would be very heavy, hove-to in the lee of Hainan Island, and rode out the storm under a full head of steam. The fore storm-staysail, set to steady the vessel, was carried away, and four boats were torn from their davits. Hatches battened down, vessel shipped sea after sea, till oil was used in bags towed from the weather bow. Weather thick and misty, with continuous heavy rain. The critical examination and analysis of the action taken by steam and sailing vessels encountering such storms, under the many and constantly varying conditions that occur in actual practice, the rules that govern such action, and the results that follow it, furnish the very best, and indeed only, method of impressing upon masters of vessels the vital importance of this branch of their profession. Practical men want practical information, with concrete, definite examples drawn from real life, with details familiar to their own individual experiences. The lecturer was willing, he said, to submit this proposition to his audience, and to ask if such instances, taken from the records of the Hydrographic Office, with names, dates, positions, and all details given, were not infinitely more effective in impressing such facts upon the mind than some ideal imaginary situation gotten up to suit some particular line of argument, and, perhaps, never likely to occur in actual practice.

Now, the records of the Hydrographic Office contain hundreds—he might almost say thousands—of such reports, more complete, probably, than similar records in any other office in the world, and he regarded it as worthy of an earnest effort on the part of all concerned to see that means were provided for their publication and circulation among the hundreds of voluntary observers who have willingly contributed their time and services in taking and recording their observations day after day, month after month, and year after year, aboard vessels in every ocean of the globe.

To illustrate the special dangers of navigation in the West Indies, the birthplace and natural habitat of these terrible storms, a copy of one of the Hydrographic Office charts was projected upon the screen, and attention called to the intricate and dangerous character of navigation in these waters. Remembering the circulation of the wind in one of these cyclonic storms, it will be readily seen that every hurricane that skirts the West Indies and the Atlantic seaboard of the United States, is sure to put hundreds of vessels in danger of being driven on a lee shore, and lost beyond all human power of deliverance. Just such tracks were those followed by the two hurricanes of August, 1887, which were then exhibited, plotted from more complete and reliable data, by far, than have ever been collected in connection with any hurricanes on record. The tracks of only a few of the many vessels from which reports had been received were shown upon the same chart, and served to give some idea of the completeness of the data. Of these, the first originated off the coast of Africa, about the Cape Verde Islands, August thirteenth, and moved at a high rate of speed westward, across the Atlantic, recurving east of Florida, striking Cape Hatteras with furious energy on the twentieth, carrying havoc among the gallant fishermen off the Grand Banks on the twenty-second, and passing to the northward of the British Isles and coast of Norway on the twenty-ninth and thirtieth—a track more than seven thousand miles in length. What a tremendous engine of destruction!

"Let us," said the speaker, "watch its original progress. Imagine to yourself a hot, sultry August day in the tropics, off the Cape Verde Islands, at about the northern limit of the belt of equatorial rains and calms, where the northeast trades have become fitful and irregular. The uniformity of the trade sky is disappearing, and the little masses of cumulus clouds that have flecked the sky from zenith to horizon gather together here and there, as if undecided what to do, and now and then rise in tall, massive columns, that grow before the eye and mount higher and higher, till one lazily wonders how high they will rise above their broad level bases before they reach some upper current that will scatter their beautiful crests and spoil their snow-white symmetry. In the distance an occasional dark mass is seen, from which heavy rain is falling, with sometimes a broad flash of sheet lightning. In one of the tall masses of cumulus, off to the westward, taller and more majestic than its mates, a slow gyratory motion can be detected, which, gathering strength, rapidly draws in the warm air from below, saturated with moisture, and sends it aloft into cooler and cooler regions, to add rapidly to the growing and darkening mass of clouds. A new feature catches the eye; long, graceful, snow-white, feathery plumes reach out at the top of the mass, projected against the deep, clear azure sky. Beneath them the sharp rounded, upper edges of the now dark and threatening cumulus begin to grow misty and indistinct, and the inner shafts of the radiating cirrus plumes are lost to sight in this now misty vail. Gradually faint, and then sharp, dark, horizontal lines appear against the cumulus, and rapidly grow into stratus clouds, as though a fine rain were falling and settling at the level. Below, the distant horizon is now obscured by heavy rain.

Off to the northeast some little trade-wind clouds are moving this way; watching them a moment, as they rise toward the zenith, some mysterious force over there to the westward seems to attract them, and their paths curve that way. What does it mean? you say, and looking in that direction you see more little patches of scud moving across from left to right, and notice that a breeze is springing up from the east, while the barometer is falling slightly, and the whole great mass of clouds is moving westward. A hurricane has had its birth, a great cyclonic storm has started on its westward march toward St. Thomas, Hatteras, Cape Race, and Norway. One of our western tornadoes is to this monster as an electric light to the noonday sun, and all the tornadoes in the records of the Signal Office, rolled into one and added to it, would hardly add appreciably to its energy.

"Whirling along its ocean pathway at an average velocity of nearly twenty miles an hour, it sends out a long rolling swell a thousand miles in advance, and is heralded by long, high feathery plumes of cirrus clouds, radiating far beyond the slowly thickening cirrus vail that casts its pale halo over sun and moon, and at dawn the twilight envelops heaven and earth with an awful fiery glare, like the light of some great conflagration. Soon the massive leaden-colored cloud bank heaves in sight above the horizon, a great mountain range—Ossa piled upon Pelion—and flying scud forms overhead and drifts to leeward, not with the surface wind, but at a marked angle to the right, moving with the upper currents of the great whirlwind. At intervals fine misty rain seems to grow out of the air, and then vanishes again, and the squalls freshen. The barometer sinks lower and lower, heavy clouds cover the whole horizon, and the low distant moan gradually changes into the shrieks of a thousand demons wrenching at the stout masts and spars, tearing the strong canvas into shreds and fluttering pennants, hurling timber and masonry into heaps of shapeless ruins, driving wild breakers high up on land, and laughing to scorn the feeble strength of man. Suddenly a pause. Silence. Calm. The warm, bright sunshine of a summer day. A brief glimpse of heaven. And then another seeming eternity of hell. As is often the case, a second hurricane succeeded the first after a few days' interval, following approximately the same track." Time did not allow the speaker to go into any detailed description of either one, although each would be well worthy of a volume.

The lecturer then spoke briefly of his visit to Cuba during September and October, 1888, under orders from the Secretary of the Navy, issued at his own urgent application. These two months constitute the latter half of the hurricane season, and October is specially dreaded because of the fact, already mentioned, that October hurricanes recurve in just the latitude of the island, which they cross from south to north, retaining all the furious intensity that marks their paths at sea. The very day that he sailed from New York the great September hurricane had just swept across the island from east to west, and was expected to recurve across the peninsula of Florida and reach the Gulf Stream again off Hatteras. Diagrams were given to show the remarkable deflection of this cyclone toward Vera Cruz, and the track of another one that followed close after the first but recurved about as usual. Various diagrams and illustrations were given in the effort to convey some idea of the summer climate in the City of Havana, the historic, picturesque old Spanish capital of lovely Cuba, "la Perla de las Antillas," and to describe some of the leading results of the studies of Padre Viñes, the eminent Havana meteorologist, whose scientific ability, indefatigable energy, and unrivaled opportunities have linked his name so inseparably with all recent advances in our knowledge of these storms. Indeed, the lecturer had himself suggested coining the word "Viñess," to express

for our tropical storms what the word "typhoon" does for those of China, in honor and recognition of the distinguished services of his esteemed friend, the Director of the Meteorological Observatory of the "Colegio de Belen."

Regretting that his limited time did not allow him even to mention the many other incidents of his month's stay in Havana, Mr. Hayden returned to the subject of the deflection of hurricanes from their normal paths, a subject of infinite importance, both theoretically and practically. To select a case that admirably illustrated exactly what was meant, how and why the deflection took place, and the manner in which it was possible to anticipate and predict it, he illustrated by means of six synchronous weather charts, shown upon the screen together, the weather conditions at noon, G. M. T. (7 A. M., seventy-fifth meridian time), October ninth to fourteenth, inclusive, 1886, during which time one of the most severe hurricanes ever experienced in the Gulf of Mexico originated south of Cuba and west of Jamaica, recurved in the usual latitude, off Cape San Antonio; but then, completely foiling Padre Viñes' published predictions, turned to the westward, swept over the entire Gulf of Mexico and up the Mississippi Valley to Lake Huron and the St. Lawrence Valley. Only the other day a report was received from Captain José Riera, with graphic details regarding the loss of his vessel, the Spanish bark Tres Auroras, in the very vortex of this terrific storm about one hundred and twenty miles north of Cape San Antonio, and the marvelous escape of six of the crew—thirteen in all—after tossing about for four days on wreckage from his vessel. The charts showed that a strong anti-cyclone had prevailed over the middle Atlantic States, and that it was this that had blocked the track of the advancing cyclone and forced it westward before allowing it to go north, so that it eventually reached the Atlantic by way of the great lakes and the St. Lawrence Valley.

These same considerations were shown to have held good in other cases, notably that of the great Cuban hurricane of last September, and the comparatively recent hurricane that devastated our Atlantic seaboard the last few days of November, blocked in its northward progress by an anti-cyclone over the Gulf of St. Lawrence, and venting its baffled rage upon the Samana and a dozen other vessels, sent to the bottom with all on board, almost in sight of their homes, firesides, and friends. The physical explanation of this interaction between cyclone and anti-cyclone is simple enough, and lies in the fact that the fuel of the cyclonic furnace is warm, moist, ocean air, which ascends, precipitates its moisture, and is carried away in the upper atmospheric currents, to descend again in the anti-cyclone or "high" as cool, dry air. Just as a great forest fire changes its course when it meets a clearing and dies out or runs around it, so a tropical cyclone follows the lines where its fuel is most abundant, and rages with greatest intensity where the tropical sun and tepid ocean currents load the heavy atmosphere with moisture. In the words of Shakespeare, that immortal painter of the smiles and passions of nature and mankind, "The sun's a thief, and with his great attraction robs the vast sea."

Four synchronous weather charts, prepared from hundreds of reports received from vessels off our coast during the November hurricane, presented at a glance the most striking features of that great storm during the period of greatest intensity, and the progress or growth of the hurricane in the direction of heaviest rainfall was illustrated by a weather map for August 21, 1888.

The March blizzard, one of the most notable storms of the century, and of a very different type from those that had just been considered, was illustrated by means of six lantern slides, in colors, showing the progress from west to east of a long line or trough of low barometer, extending

from Hudson Bay to the Gulf of Mexico, moving toward the Atlantic at the rate of six hundred miles a day, in the form of a great arched squall, whose front was more than a thousand miles in length, in front southeasterly winds drawing supplies of warm, moist ocean air from far down within the tropics, and in rear a long battalion of cold, northeasterly gales, carrying temperature below the freezing point far down the line into Louisiana and Mississippi. The speaker dwelt upon the enormous increase in the energy of the storm when it reached the Atlantic, the terrific combat between Arctic and Gulf Stream forces, and the obstruction encountered by the center of the line in the form of a stationary anti-cyclone about Newfoundland. A track chart, giving the tracks of vessels, and a barometer diagram, illustrating the fluctuation of the barometer at selected positions ashore and at sea, were discussed, and it was stated that one hundred and thirty-eight vessels were blown ashore, sunk, or damaged along the coast of the United States north of Hatteras. Off the coast, west of the fortieth meridian, some twenty vessels were sunk or abandoned, among them the gallant New York pilot boats, Phantom and Enchantress, and the yacht Cythera, with all her brave crew—friends and fellow yachtsmen of his present audience and old members of the Seawanhaka Club. Among the abandoned vessels was the American schooner W. L. White, and this derelict vessel commenced a long, aimless voyage across the Atlantic, at the mercy of the winds and currents, with no hand at the helm by day and no lights at night to warn navigators of their danger. Ten months and ten days later, after wandering more than five thousand miles, she stranded on one of the little rocky islands of the Hebrides, off the northwest coast of Scotland, and has thus completed the last act of this great ocean tragedy.

The following conclusions were quoted from the speaker's monograph description of the great storm, recently published by the Hydrographic Office: "It has enforced in most unmistakable terms the importance, not only to our extensive shipping interests, but to the people of all our great seaboard cities, of the establishment of telegraphic signal stations at outlying points off the coast; at St. Johns (or Cape Race) and Sable Island, to watch the movement of areas of high barometer, upon which that of the succeeding 'low' so largely depends; and at Bermuda, Nassau, and various points in the West Indies and Windward Islands, that we may be forewarned of the approach and progress of the terrific hurricanes which, summer after summer, bring devastation and destruction along our Gulf and Atlantic Coast, and of whose fury this great storm is an approximate example and a timely reminder. Moreover, there are other important objects to be gained, in addition to the better forecasting of stormy weather off our coasts and along the transatlantic routes. Every edition of the Pilot Chart records the latest reported position of numerous derelict vessels and other dangers to navigation—submerged wrecks, buoys adrift, icebergs, and masses of field ice. But at present such reports are necessarily several days old, and the present positions of these dangerous obstructions must be roughly estimated, allowing for their probable drift in the interval of time that has elapsed since the report was made. There are recorded, also, the probable limits of frequent fog for the ensuing month and the regions where fog was most frequently reported during the preceding month. But general averages only give the regions where fog is most likely to be encountered; they do not and cannot attempt to state whether or no there will be a fog at a given place at a given time. But scientific research and practical inventive genius, advancing hand in hand for the benefit of mankind, have discovered not only the laws governing the formation of the dense banks of fog that have made the Grand Banks dreaded by naviga-

tors, but also the means by which certain facts may be observed, telegraphed, charted, and studied a thousand miles away, and the occurrence of fog predicted with almost unfailing accuracy, even while the very elements themselves are only preparing for its formation. By means of such predictions the safety of navigation along the greatest highway of ocean traffic in the world will be vastly increased—routes traveled yearly at almost railway speed by vessels intrusted with more than a million human lives and property of an aggregate value of fully a billion dollars."

The lecturer closed his lecture by referring again to the commercial importance of the great body of water known as the Bay of North America, exhibiting diagrams that brought out very clearly to the entire audience the various features of greatest importance in connection with a comprehensive and effective system of telegraphic weather service for the benefit of the commerce of every nation frequenting these waters, as well as of the inhabitants of its coasts and islands, from Venezuela to Newfoundland. A photograph of a superb relief model, the property of E. H. Butler & Co., of Philadelphia, illustrated the general topographic relief—an essential feature in connection with meteorology; a chart of ocean currents indicated their important bearing on the subject, and a map of telegraph lines and cables, existing and proposed, showed that the shore and islands were joined by an almost perfect network, giving the most admirable facilities for an almost perfect system. The conclusion of Mr. Hayden's paper was as follows:

"In apology for having detained you so long to-night, I must plead the tremendous importance of the subject you have chosen for my remarks, the vast field it covers, the completeness of the records and data at my command, and my own absorbing interest in the subject. Here in this great Bay of North America commercial interests are at stake of vastly greater importance than in any similar body of water in the world—interests involving every commercial nation. To the north are the British Provinces, already coöperating with our Signal Office, descendants of our own forefathers, and linked to ourselves by the strongest bonds of geographic position and commercial interests. Then comes this great Republic, just growing into the full strength of manhood, and reaching out the hand of peace and friendship, not of conquest, to all mankind. To the south, the Spanish American Republics and the greater and lesser Antilles, where almost every European flag is represented, and where the benefits of an efficient weather service, conducted by means of united efforts and well directed coöperation, would be enormous. The completion of the Nicaragua Canal will soon change the great routes of ocean traffic, and divert into these waters half the tonnage of the world. Coincident with my recent visit to Havana, a Department of Marine Meteorology, or a Marine Observatory, has been established under the direction of my esteemed friend, Captain Luis Garcia y Carbonell, of the Spanish navy; and the French and Spanish cable companies, with a broad minded and generous liberality, have granted him the franking privilege for his telegrams over all their lines. Will it be too much to hope that our own companies will grant us the same privilege over their lines from Key West to Havana, and to Tampico, Vera Cruz, and Progreso?

"Here at home we have a superb weather service, the admiration of the world—a fact I would call to the attention of that portion of the press that racks its brains to get up cheap jokes about it—but circumstances have compelled it to devote almost its entire attention to the pressing needs of our great inland States, and to almost neglect commerce and the seaboard. I was amused the other day to read of the anxiety shown by Lieutenant

Maury, when, in the full flush of the success of his great system of meteorological observation at sea, to have the system extended to the land: 'In my humble way,' said he, 'I have been advocating the establishment of a similar system of weather reports and telegraphic warnings, not only for the shipping, but for the farmers also of the United States.' Shades of Maury, look down upon us now, and lend the influence of your great name to help regain for your beloved shipping some small share of the benefits of the great system that you did so much toward organizing!

"I want to live to see the day when there is a first-order light at Hatteras Shoal, Mantanella Reef, and Hillsboro Inlet, in addition to the magnificent lights we have already, and when weather forecasts at least as good as those signaled off to shipping at Hongkong or in the Bay of Bengal are available to navigators at every prominent lighthouse and headland of the shores of the great Bay of North America, and I expect to do it, too. I intended to have read extracts from at least a few hurricane reports from vessels of our own build, and flying the stars and stripes—the thrilling experience of the steamship Knickerbocker, or Manhattan (two good old New York names), in these great hurricanes off our coast—but time forbids. I cannot forbear, however, from reiterating the fact that it is to an American that we owe the discovery of the law of storms in almost all the perfection and simplicity that we know it to-day—a discovery that has revolutionized meteorology and resulted in the saving of thousands of lives and millions of dollars' worth of property at sea. The empirical laws of Kepler in astronomy, the grand results in biology of Darwin's vast accumulation of facts, and the deduction therefrom in the hands of that great master, find their parallel in the thorough and painstaking work in collecting data, the scientific skill and insight in their consideration and comprehension, and the lifetime's devotion to this one subject, of Mr. Redfield, of New York."

ERRATUM.

On page 168, the last paragraph should have been omitted.

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